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# HANDBOOK FOR RANGE MANAGERS

## REGION 5

By

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# BACKGROUND AND PURPOSES OF THE HANDBOOK

The practical experience gained in managing grazing on ten to twelve million acres of national forest land in California and western Nevada during the past thirty years is the principal source of the material used in the Handbook. This has been supplemented by research and to a major degree by the experience of the range livestock industry in meeting problems of forage supply, in adapting their operations to changing conditions and pressures, and in working out patterns of economically feasible management. The literature on range management has of course been consulted.

The Handbook is prepared for the forest officer who has the tremendously difficult job of making current decisions involving who, what, where, how long, how much and in what manner. He deals not alone with the range and its complex combinations of soils, topography, plant species and range types, but with human beings—the permittees—with and through whom he must work to obtain sound and permanent management of the national forest ranges.

The scope of the Handbook has been intentionally confined to the problems of the national forests of the California Region.

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## HOW TO USE THE HANDBOOK

The make-up of the Handbook is designed to suit it for field use. Don't file it; keep it with you.

1. Study first the Table of Contents to learn the structure of the Handbook.
2. Study and learn the principal groups of important plants, both those valuable as forage and the other groups of special significance.
3. Learn the situations in which to look for different plant species.
4. Study the soil, water and plant relationships, and the processes through which the natural relations may be changed by grazing. Learn the progressive stages in range deterioration which may be identified readily.
5. Study the problems in some particular subject, such as Setting Opening Dates, referring back to the information in 2, 3 and 4 above.
6. Learn to use the Index to find readily the material on the various subjects.
7. Study the Range Inspection section and learn the specific points to cover and the specific information to record in inspections made for various specific purposes.
8. Constantly compare the Handbook problems and cases with those you meet in your job.

# WHY RANGE MANAGEMENT?

Range management is controlled and lasting use of forage crops and land. It is an aim, an attitude and a set of specified practices in contrast to uncontrolled use, that is, exploitation, misuse of crop and land.

The range livestock industry developed in a period when free, uncontrolled use of resources was the accepted rule. Free public range was captured by the strong or the first to arrive. The need for conservative use, preserving the range, had not yet been recognized, and if an individual didn't use it fully while he had a chance, someone else would. Competition for range became so ruthless that the fight for existence of operators overshadowed all else.

The struggle for individual security arose from this background. It was expressed in ownership and development of home ranches, in patenting key areas on mountain ranges, etc. But, by and large, the business remained one in which the operator still gambled on the good year, on numbers rather than quality of livestock, on an occasional clean-up to tide over the recurring heavy losses. Banking intensified the worst features of the industry by looking at numbers of livestock as collateral, rather than to conservative use of ranch and range.

Many operators early recognized the overuse of the range and its deterioration which inevitably resulted. But it was difficult or impossible for them to do other than follow the general pattern of their industry. By the time the national forests were created, evils other than range abuse had become prevalent, particularly monopoly by the strong and lack of opportunity for the beginner. National forest range management attacked the recognized evils of the time.

The grazing policies and programs initiated on the national forests were developed first by men experienced in the livestock industry in the West who came into the Federal Forest Service, then through trial and some errors mainly in minor detail the major policies and programs developed. These originated with the livestock operators themselves, expressed through the advisory boards of the local, state and national associations. Setting up definite range units, elimination of the fight for range, making the ranges a part of home ranch operations, adapting class of livestock to character of range, and the system of dependency, all tended toward security of the operator.

The idea of range management, however, was not always readily accepted. Old habits of putting on the range as many livestock as possible, as early as possible, and leaving them as long as possible, still expressed the traditional attitude of the mind bred from the early history of the range livestock industry.

Even as a degree of stability came in allotment of national forest range, in working out balanced units of operation, old pressures and attitudes continued. Increased costs of operation, extended use of credit, and the neces-



sity to meet immediate obligations still meant pressure to gamble on maximum numbers of livestock and overuse of the range. The unfavorable season was regarded as the main cause of poor range conditions. This attitude was against conservative range use.

Despite the difficulties, the concept of range husbandry or management applied to public range as well as to private, developed. First, naturally, with the larger, stronger outfits on their own ranch and range. Less rapidly with the smaller operator, owning a home ranch, who naturally tended to feel that the public range, rather than his own land, should take up the shock of the bad year.

Even today, in the continuing transition from unlimited use to conservative management, as the economics of operations become more critical and as the difficulty of overcoming old habits of thinking continues, conservative range use is still resisted and debated.

It should be no more necessary to prove over and over that range types are vulnerable to exploitative use than it is to demonstrate again that repeated light fires end by destroying even the finest and most durable forest. Range management has proved its own need by the known ruinous results of its absence. The deferment of final ruin does not any longer mask the early and inconspicuous beginnings, resulting from lack of controls.

To the individual, overuse of the range may, to be sure, be temporarily advantageous. If he has an operation through which he can make a living by conservative and safe use, he may still increase his income for a time by exploiting the forage and soil. With luck he can then retire and leave to someone else the long-time and costly process of restoring the resource. Or, if he has an operation that can succeed temporarily only by overuse, as for example by repeated burning, he can exploit the land and finally desert it.

On the other hand, the economics of range use of public properties has to be judged by only one thing—permanence. If management fails to preserve productivity, then it is a failure.

Serious depletion on public ranges can be cured with least effort and cost by reduction or elimination of grazing use, if preservation of the resource is the only value at stake. Management on such areas, however, must necessarily be concerned with the business success of the private individuals who use them, at least to the extent that permanency of the industry is involved. The test of successful management is preservation of the public ranges and of the opportunity for successful private enterprise on them. For these reasons the range manager of national forest ranges at least must not ignore nor delegate to others those problems. They go hand in hand with his everyday job of management, protection and administration.

The need for controlled management of public ranges is set by the need to preserve them as a national asset, and, in so doing, to preserve the opportunity for successful and permanent private enterprise on them.

# WHAT THE JOB OF RANGE MANAGEMENT IS

## A. The aims of the Forest Service are :

1. Full, continuing, controlled use of forage as an equal part of multiple-purpose management, where :
  - a. Use does not permanently damage soil, watershed, or forage plant cover.
  - b. Temporary closure for soil rebuilding is not required.
  - c. Use does not prevent establishment of needed tree reproduction.
  - d. Use is not in serious conflict with concentrated recreational use, scientific areas, or determined wildlife needs.
2. Allotment of use so that :
  - a. Individual permittee can make a permanent living on a decent level.
  - b. National forest use makes possible a balanced year-long operation.
  - c. Naturally dependent communities are stabilized.

## B. Ability of the range manager to meet these aims requires :

1. Ability to judge the degree of use each portion of the range will stand without deterioration.
2. Ability to recognize through accurate observation whether all or each part of a range is deteriorating or improving.
3. Ability to decide whether the cause for range deterioration is wrong season of use, wrong kind of livestock, too heavy stocking, poor management of livestock, or a combination of causes.
4. Ability to recognize and measure conflicts with timber, recreation, and other forest values.
5. Ability to devise or select means to correct abuses or conflicts.
6. Ability to work with the permittee to correct abuses and to obtain good management.
7. Ability to determine real need for range by specific permittees or applicants.
8. Ability to decide when existing range permits are perpetuating un-economic operations and failing to improve the level of living for permittees.
9. Ability to work out over a period the needed changes in allotment of range.
10. Ability to recognize errors in judgment and practices and to avoid them in the future.



# THE RANGE

“The range” usually refers to the plants which serve as food for live-stock, together with such factors as topography, accessibility, and availability of water, which combine to affect the usability of the plants.

The range has to be understood before it can be managed. What it is, or was, in a natural state; the nature of its reactions to use by cattle or by sheep; the soil and the marks by which may be judged the changes started by the wrong kind of use; the plants, good or otherwise, their significance, and the ready means to identify them; the important natural range types and the marks which show whether they are being maintained under use or are deteriorating. The details are complex, but the essential processes which may be set in motion by use of the range can readily be understood and observed.

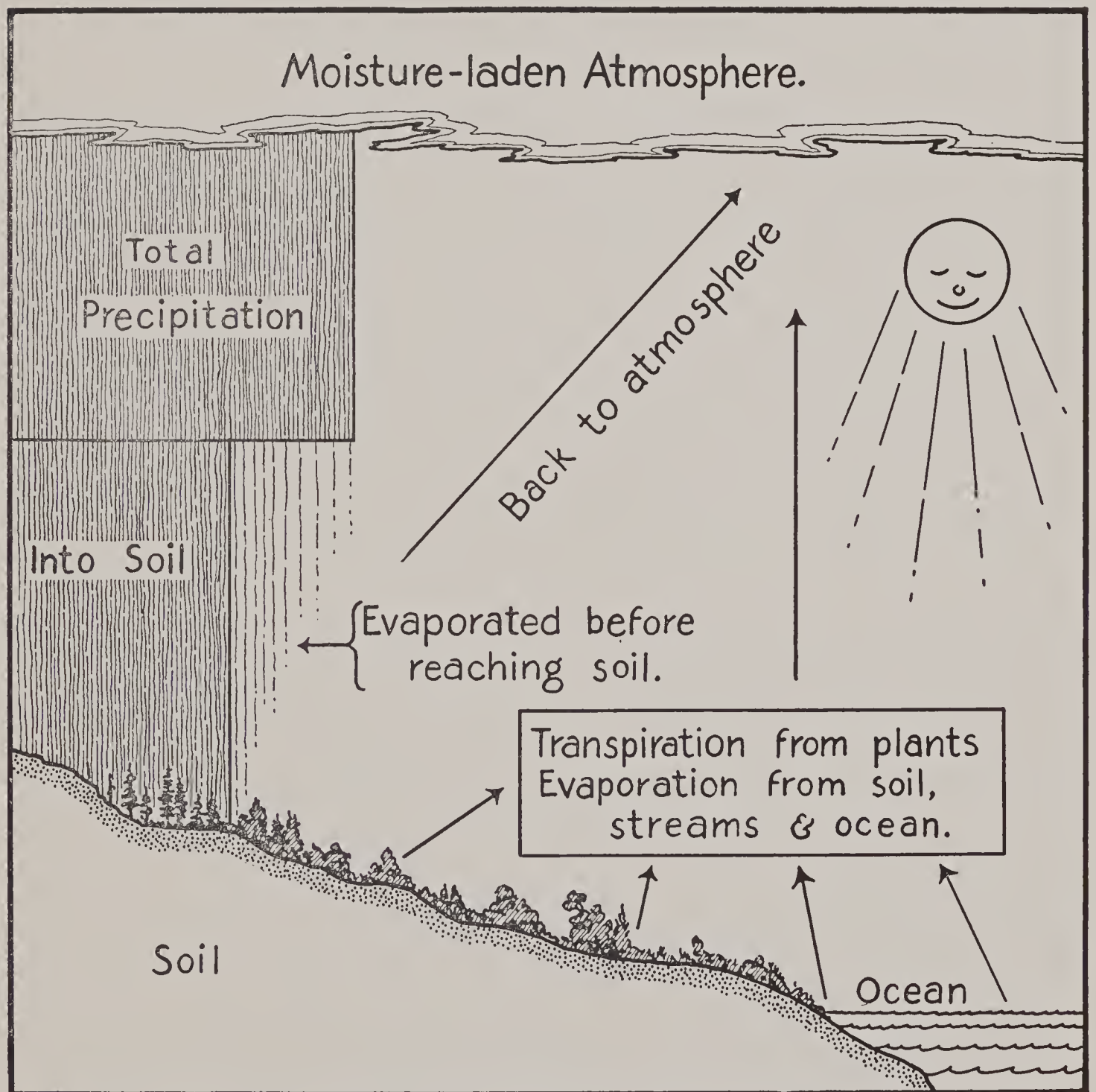


Figure 1.—PRECIPITATION—WHERE IT COMES FROM—WHERE IT GOES

# THE PLANTS

## THE PLANTS GROUPED FROM RANGE STANDPOINT

Botanically the plants found on the range number several hundred species. To the user or manager of the range, what is important is not the botanical relations, but whether a species is abundant or scarce, whether it is useful as forage or not, whether it is poisonous, whether its presence or absence is a mark of range deterioration or abuse. Grouping the multitude of plant species thus results in a list for Region 5 of about thirty-three important range plants, grasses and grasslike plants, weeds and browse; in a list of six important poisonous plants; and in a list of eight species useful as indicators of overgrazing.

The detailed description of each of these species is given later in the Handbook.

## HOW PLANTS LIVE

Each plant goes through the same stages—beginning, growth, reproducing itself, and death. Each has a growing and a resting period. Each has its youth, maturity, and old age. But different species vary enormously in the timing of these steps. Some species, at high elevations with a short growing season, go through the whole life cycle in a few weeks, from germination to death.

The annual plant, which completes its whole life in a single season, has one essential—to mature its seed. If that is done, the species will survive. If not, it will vanish. Range use needs to be timed so as to permit maturing of seed by part of the plants of each species.

The species which live longer than a single year, the perennials, must in addition manufacture food in the leaves and store part of it in the roots over the resting period, this to be drawn on in starting growth the following spring.

Not only does the growing period for a single species fail to conform exactly to a specified calendar date each year, but the different species are thus affected differently by being grazed on the same calendar date, because the development for the species varies so greatly. If the essential steps of flowering, seeding, and storing food in roots are completed in early season, then later season grazing may not be harmful. If continuously cropped during its growing season, the plant has a poor chance to complete the essential steps in its life.

The roots grow as the top is able to make and send food to them. If the top is kept from growing, the roots suffer. If the roots do not thrive, top production will later suffer.

All plant species have the flexibility to meet occasional or intermittent disturbances to their life cycle. None has the power to meet indefinitely a serious and continuous interference.



Each species prefers a particular combination of soil, temperature, and moisture. Some are more adaptable than others, but each has limiting factors which are most necessary for the completion of its life cycle. Many species cannot endure the poor soil drainage of the wet meadow. Others demand it. Some require a long growing season. Some demand a shady, cool situation. Others live only in full sun.

#### COMMON ADAPTATIONS AND THEIR SURVIVAL VALUE

Adaptation	Biological (Survival) Value
Heavy tap root	Storage of food in large quantity and anchorage
Flowering before leaves appear	Insurance of fruiting
Spines, etc.	Protection: reduces transpiration
Tough, leathery leaves	Reduces transpiration
Bright-colored, scented flowers	Insures fertilization by insects and birds
Hard-coated seed encased in pulp	Insures spread by mammals and birds
High flower stalk	Insures fertilization by wind
Seed with spiral coil or spines	Insures spread by catching on animals
Hard-coated seeds holding in soil	Insures perpetuation
Woolly leaves	Reduces transpiration
Dwarfs	Protection against snow
Deep root	Greater moisture supply
Seeds with wings	Insures spread by wind
Unpalatable leafage	Protection from cropping

### THE SOILS HOW FORMED

Soils are formed in one of three ways:

1. By the disintegration or breaking up of the underlying rock. These are the residual or primary soils of the hills and mountains. Many things contribute to the process of disintegration—the filtering of water through fissures in the rock; its chemical reaction to the rock minerals; the freezing and thawing of water in the rock; the action of plant roots; the action of air. The process of developing this type of soil is very slow. It is said that it takes a hundred years for one inch of soil to form.

2. By being carried by water, glaciers, or wind, usually by water, from the place of origin to a place of deposit. These are the secondary or alluvial soils of the wet meadow, the debris fan, or the valley. In undisturbed nature, this process goes on continuously but slowly—the so-called “geologic norm” of erosion. If the soil balance on side hills or in stream channels is disturbed, the process may be more rapid—“accelerated erosion.”

3. By direct volcanic action with deposit over land regardless of topography; distinguished from formation of residual soil from volcanic rocks.

## PROPERTIES OF SOILS

Soils are characterized in many ways, including the degree of weathering, texture and condition.

*Weathering* affects texture and condition and produces characteristic cross-sections or profiles. It results in important changes in topsoil and subsoil, developments such as hard-pan, etc.

*Texture* refers to the sizes of particles that make up a soil. These include :

Gravel—very coarse

Sand—coarse

Silt—fine

Clay—very fine. And a composite type,

Loam—mixture of sand, silt and clay ; the latter, if present,  
less than 30%.

Their various mixtures—silty-clay, sandy-loam, etc.

The speed of water penetration depends on size of soil particles. It is rapid in gravels and sands, slow in silts and very slow in clays. Soils which are mixtures have intermediate rates.

*Drainage* affects not only the water available, but its absence in desert areas often results in alkalinity.

*Chemical composition*: Acidity or alkalinity.

*Depth*.

*Fertility*: The humus content.

It is the topsoil, that upper layer darker in color because of the humus content, that is most important in contributing to plant growth. If soils are subject to “accelerated” erosion, the topsoil and sometimes the subsoil may be absent in whole or in part. Conversely, absence of these layers may show there is or recently was accelerated erosion.

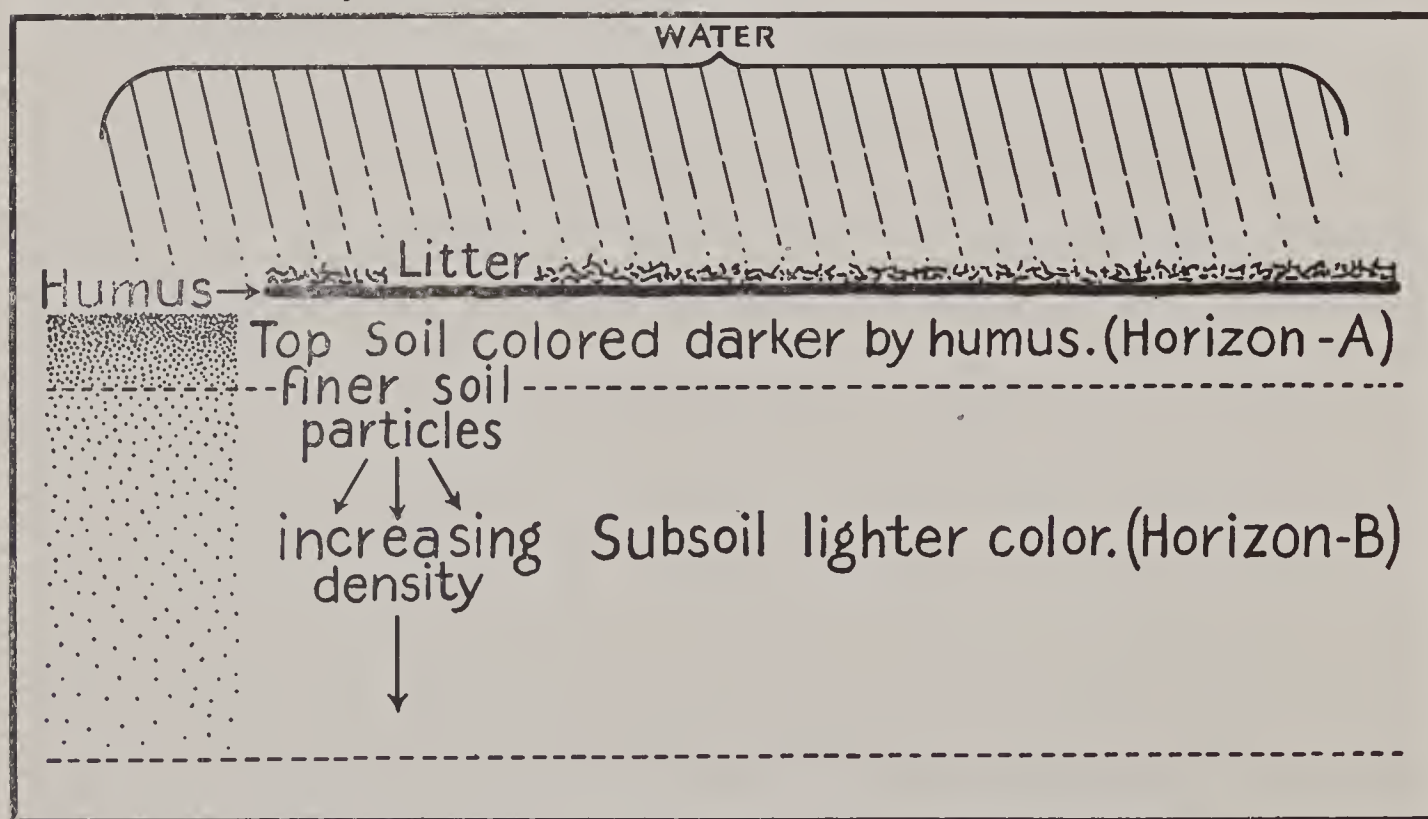


Figure 2.—SOIL AND PRECIPITATION RELATIONSHIPS

Impact of rain is reduced by litter and humus cover, absorption by soil speeded up, and percolating water carries finer soil particles into subsoil.



Experiments in growing plants on the topsoil show that growth is large, seed is produced readily, and relatively little water is required. Plants grown on the lower layers are small in volume, little seed is produced, and much more water is required. On any residual soil, forage production almost vanishes without the topsoil. (Figure 3.)

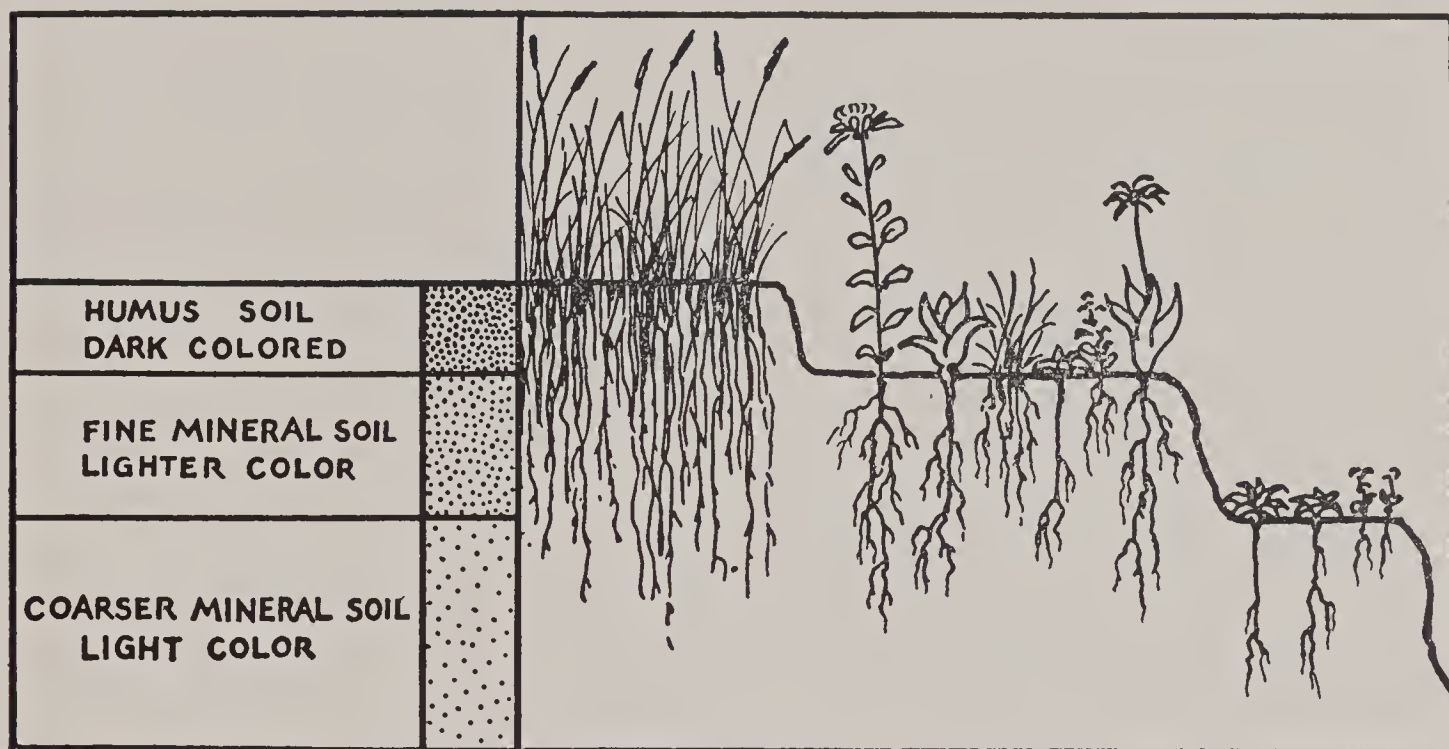


Figure 3.—RELATIVE FERTILITY OF SOIL LAYERS

The fertile topsoil will produce not only the greatest volume of plants but also the more desirable ones. As succeeding soil layers are exposed the volume of plants is reduced and less desirable species occupy the area.

Newly transported soils are commonly uniform in texture and structure along a given vertical line. Water, in transporting soil material, drops the largest particles first, then, as the gradient of the stream drops, the next largest, and so on. A single deposit in a stream channel or a meadow is usually uniform at a given cross-section. Fine-grained transported soils are usually fertile, since they are composed of the topsoil from residual soils. These develop a topsoil of their own by the same process of plant decay found on hillside soils.

## SOIL-PLANT RELATIONS AND BALANCE

### THE NORMAL CYCLE

Normally there are balanced relationships in that the plants are related to the soil and the soil to the plants.

#### PLANT TO SOIL

The plant tops break the force of the rain and thus protect the soil mechanically against the pounding and compaction which would otherwise result.

The plant roots mechanically bind and hold the topsoil as a mass.

The dead plant material as it reaches the ground surface forms a mat, a "litter," which further breaks the force of rain. Moreover, it breaks up

the flow of run-off water and thus promotes percolation and mechanically protects the soil against erosion. Lacking this protection, water first picks up the very fine soil particles, the silts and clays, and in depositing them in the topsoil “seals” it against percolation of water. When the soil is thus sealed, water, being unable to penetrate it quickly, flows in greater volume over the surface and increases the erosion.

The dead plant material—the litter—decays from the ground surface up. The resulting organic chemicals are carried into the soil, and with dead and decaying roots thereby “improve” the soil. The plant roots in their growth by forming numberless tiny channels help water to percolate. The water which reaches bedrock, where the first stage of soil formation is under way, carries humic acids—resulting from the decay of the litter on the soil surface—and acids secreted by the plant roots. These help in breaking up the bedrock and in breaking the disintegrated rock of the subsoil into the finer soil particles.

The plant mantle thus protects the surface of the soil, improves its fertility, increases the permeability to water, and aids the process of soil formation. (Figure 4.)

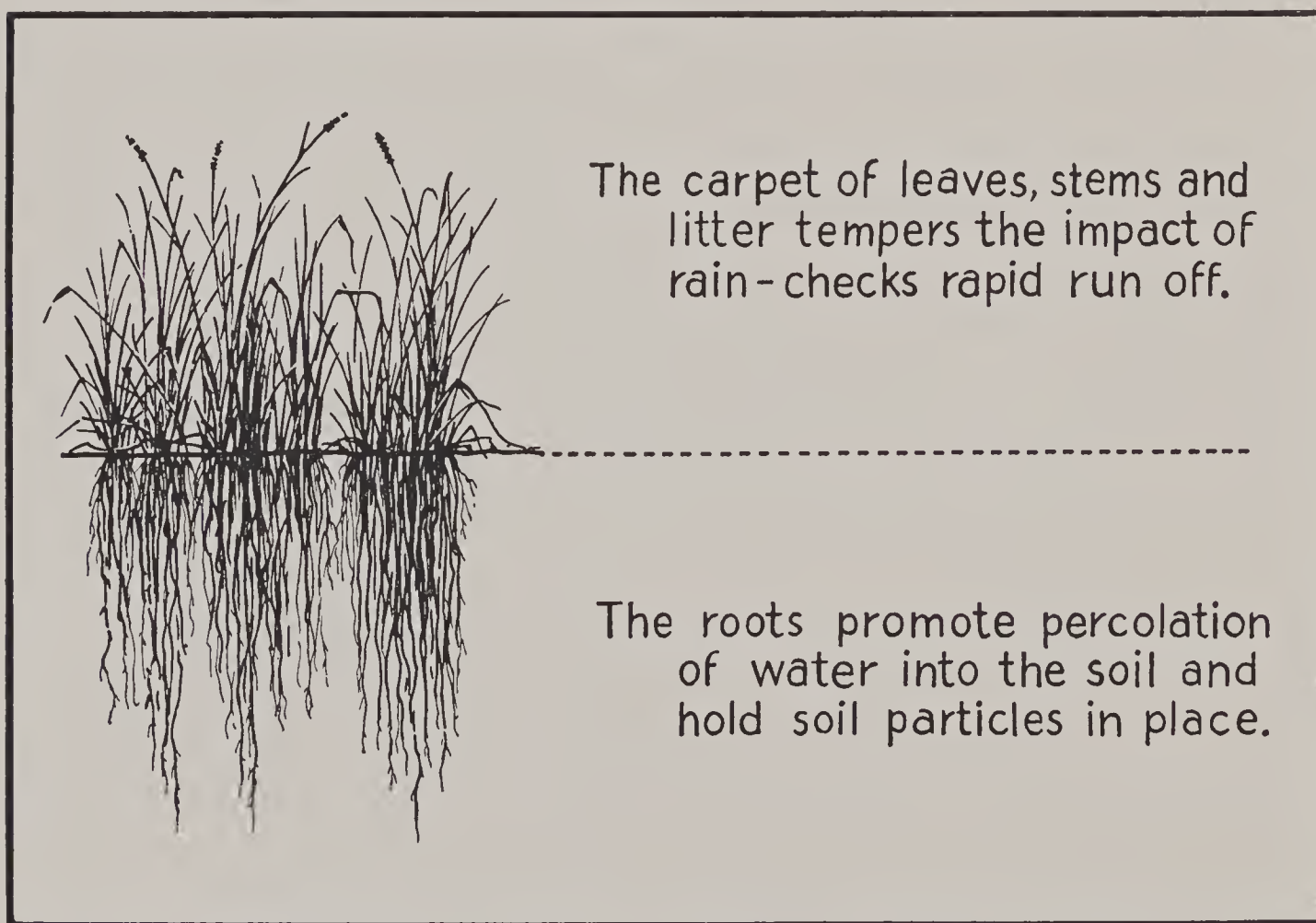


Figure 4.—HOW A DENSE PLANT COVER PREVENTS EROSION

### SOIL TO PLANT

The soil furnishes mechanical support to the plant. Rainfall is irregular, but the soil holds water for relatively long periods and stabilizes the supply on which the plant depends. The plant obtains from the soil the mineral substances necessary for its growth.



So the plant, in protecting and building up the soil, makes more plant food available to itself. The normal cycle—the more plants, the more and better soil; the more and better soil, the more plants—finally becomes stabilized and a balance established, for each spot.

### **FORMATION OF NATURAL RANGE TYPES**

Besides the normal plant-soil cycle, another process goes on continuously, that of struggle for life among the plants themselves.

When the white man with his flocks and herds moved onto the California ranges he found an almost endless variety of plant societies: the perennial grasses of the foothills and valleys, the bunchgrasses of the timber belt, the dense-sodded wet meadows of the mountains, the shorthair grasses of the high granite country, the bitterbrush and dry meadows, the grass and browse ranges under the ponderosa pine of the east slope.

Each plant society, each range, appeared fixed and unchanging. The soil was stable. The mantle of plants was unbroken. In fact, each range type, each patch, each square foot of vegetation had resulted from an age-long struggle. Each species struggled against every other species; each individual competed against all other individuals; each tried to capture its necessary share of soil, moisture, and sun; each fought to survive the forces of nature—fire, drought, wildlife; each sought to reproduce itself. There were invisible checks and balances; unseen tensions; the vanquishing of the weak by the strong; the survival of the fittest.

The apparently static range was in fact, by its very nature, vulnerable to any new factor to which it was not adjusted.

### **DISTURBANCE OF BALANCE**

The “normal” cycle, the balance between plants and soil, and between different species of plants, is a reality only at a given moment. Over any period there is change—the slow geologic process of wearing down the surface; the equally slow process of soil building; the change in the make-up of plant associations as the soil changes.

#### **NATURAL DISTURBANCES**

From time to time major upsets to the normal are caused by natural catastrophes—fire, flood, prolonged drought, temporary excess of grazing wild animals, a wave of plant-destroying insects. As a natural plant community is wiped out a new group of plants seizes the site and a new cycle of soil building and correlated plant development begins.

#### **DISTURBANCES INDUCED BY MAN**

##### **By Means Other Than Grazing**

Man upsets the natural balance in various ways. Heavy cutting of a forest exposing soil to wind action and changing moisture of the soil, road cuts that change the underground drainage on both sides of the road, fire at times, destroying the fertile topsoil and reducing the vegetation and litter exposing the soil to wind and rain; these are among the more common.

## By Range Use

The use of the natural range by livestock is an additional disturbing factor.

Each kind of livestock discovers plants which it prefers, which it seeks out and crops closely while perhaps ignoring others. So long as the favorites are available, they may be punished relentlessly as are like plant associations and the range types. To the cattle may go the wet, green meadow; to the sheep, the succulent browse and weed feed. If grazing is so early in the season, so persistent and so continuous as to leave no time for the species to seed or to store food in the roots, the death of individual and finally whole species is inevitable. Even the toughest and most tenacious of the sought-for plants suffer from persistent cropping. As the individual plant vanishes, one or another of the ungrazed competitors seizes the chance to capture the vacated space. Heavy use of the range starts a process of replacing the more palatable species by those less palatable.

Over the years, great differences in degree of change in the natural range have developed. Some species were so persistently grazed and were so susceptible to use that they have virtually vanished. Others, such as the wet mountain meadows, have displayed astonishing resistance to cropping. So, over the range as a whole, variations in degree of change from the original types have become great.

Trampling injures plants mechanically even when they are not eaten. The packing of wet soil increases capillary action and thus evaporation, and reduces aeration vital to root growth and forage production. It makes absorption of water by the soil less rapid. All of these combine to make a less favorable chance for the plants. Trampling also breaks roots, damages root crowns, and weakens plants.

A close-herded band of sheep, with its thousands of hooves, may break through the mantle of vegetation, even where it is not eaten, and thus leave the soil on slopes vulnerable to erosion. Cattle, by their habit of developing trails, wear through the sod of meadow and wet stringer, and create new channels to catch water and start erosion. They break the plant cover on banks of already existing channels and make them, too, unstable.

These new channels, once started, grow with succeeding storms. The old channels widen and deepen. All of these new and old channels alter greatly the underground water and by drainage reduce the moisture available to the plants. As water tables drop, the upper soil dries out and species and plant societies vanish, to be replaced by those able to survive with less moisture. (Figure 5.)



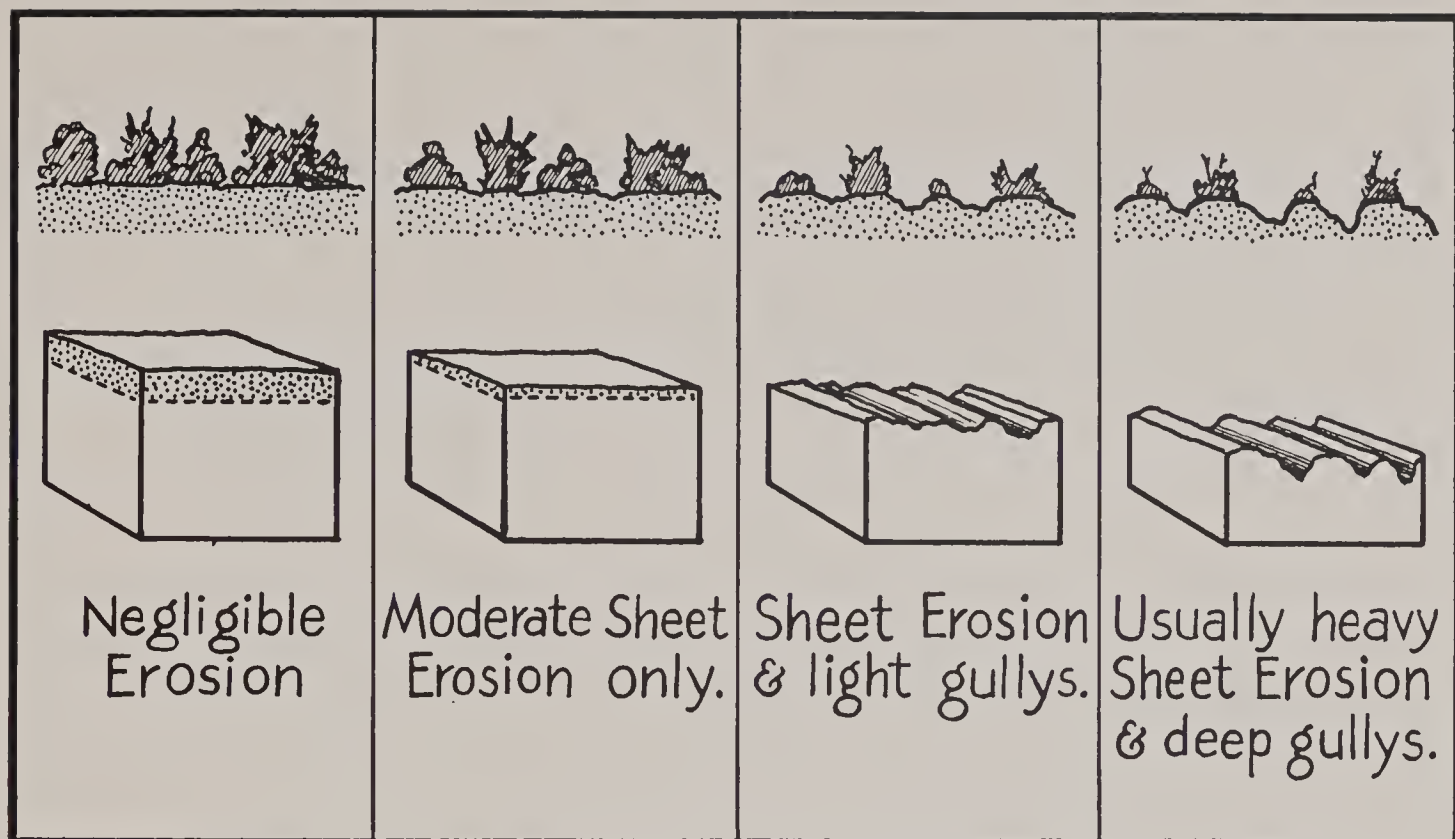


Figure 5.—THE RELATION OF DENSITY OF PLANT COVER TO EROSION

Each area with its combination of soil, slope, and other factors requires a certain density of plants and litter to hold the soil.

*The vicious circle started by overgrazing*

" The process of range deterioration and depletion started by overgrazing is, in summary form:

Heavy and selective cropping weakens and then kills individual plants and groups of plants. Less palatable, less desirable range plants, invade the space thus made available, unless erosion first damages the soil. Both invasion and erosion commonly occur simultaneously. The exposure and damage to the soil impair its quality and make it less able to sustain the original plant species. The individual plants are weakened and thereby become more susceptible to damage by grazing. As the more desirable forage plants decrease in abundance, and as the same number of livestock use the range year after year, the best remaining plants are even more closely eaten and still less desirable species are taken. This further accelerates the process of deterioration.

Soil trampling and formation of trails, starting at the same time, contribute to the vicious circle.

The key to the vicious circle is the interdependence of plant and soil—the fact that if one is disturbed the other is affected. (Figure 6.)

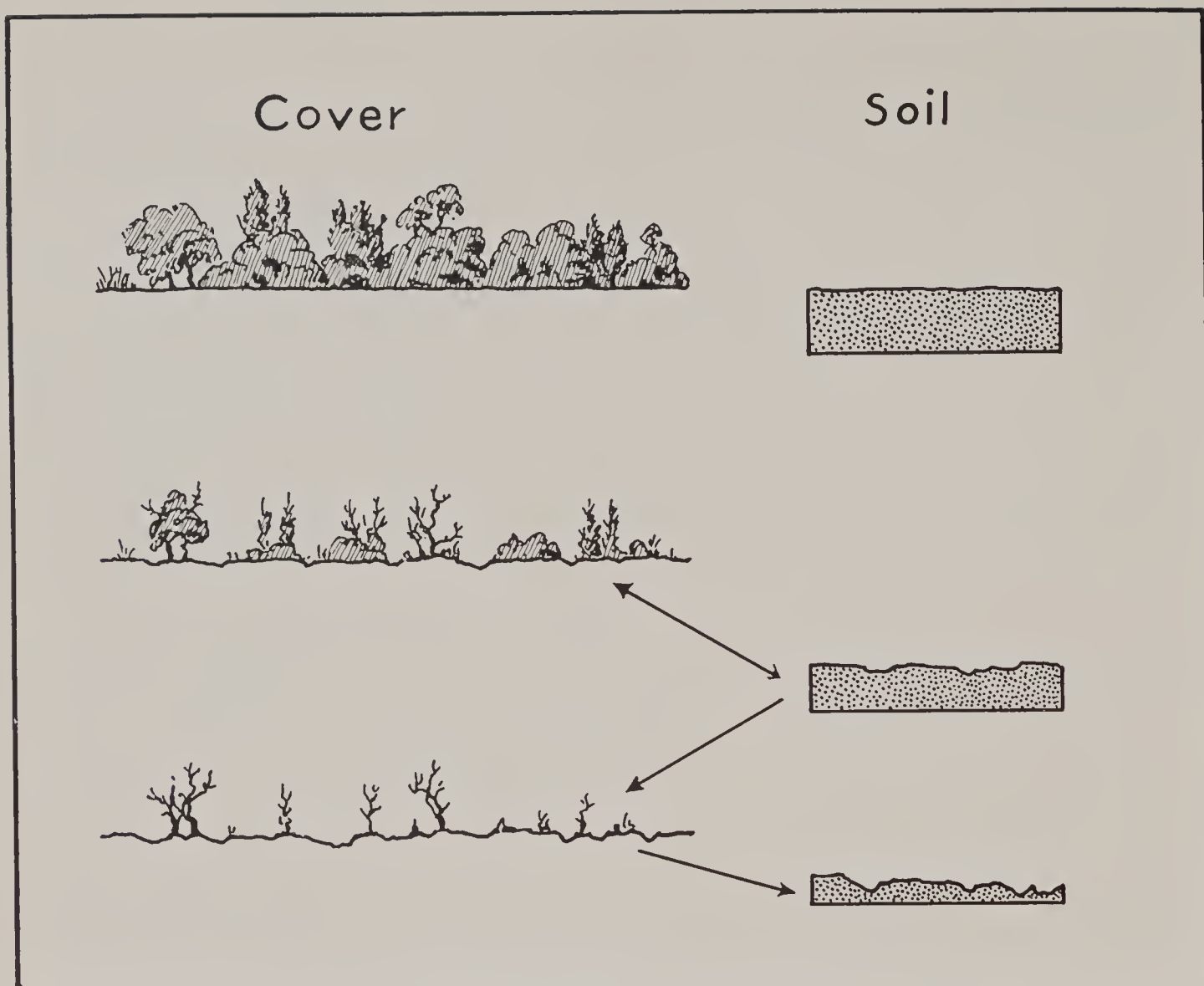


Figure 6.—THE VICIOUS CIRCLE STARTED BY OVERGRAZING

Loss of cover results in loss of soil, which in turn produces a poorer cover, and the vicious circle continues.

The changes in the plant-soil union which are caused by grazing differ profoundly from those caused by natural disturbances.

Fire or flood is a single event, and if a plant society is wiped out by them the process of recapturing the land by plants begins at once and continues without interruption. New species, able to capture and hold the bare soil, build it up and prepare the way for new groups of species.

When range deterioration is due to grazing, on the contrary, the very disturbance responsible for the trouble remains and becomes a constantly recurring factor. It has a cumulative effect, tending to intensify and accelerate damage. There is little opportunity for wounds to heal. The vicious circle can be broken only by at least temporary removal or reduction of grazing as the active cause. The characteristic is rapid damage, measured in years, and slow recovery, measured in decades or, in aggravated cases, perhaps in centuries.

## *Typical vicious circles*

### CUTTING OF THE BOTTOM OF THE WATER CHANNELS IN WET MEADOWS.

This first results in lowering of water table. The change in underground drainage results in drying out of soil, in weakening and eventual death of meadow grasses and other herbaceous plants. The lowered density leads to invasion of dry-land species such as bunchgrasses, dry-land sedges, sagebrush, perennial and annual weeds. (Figure 7.)

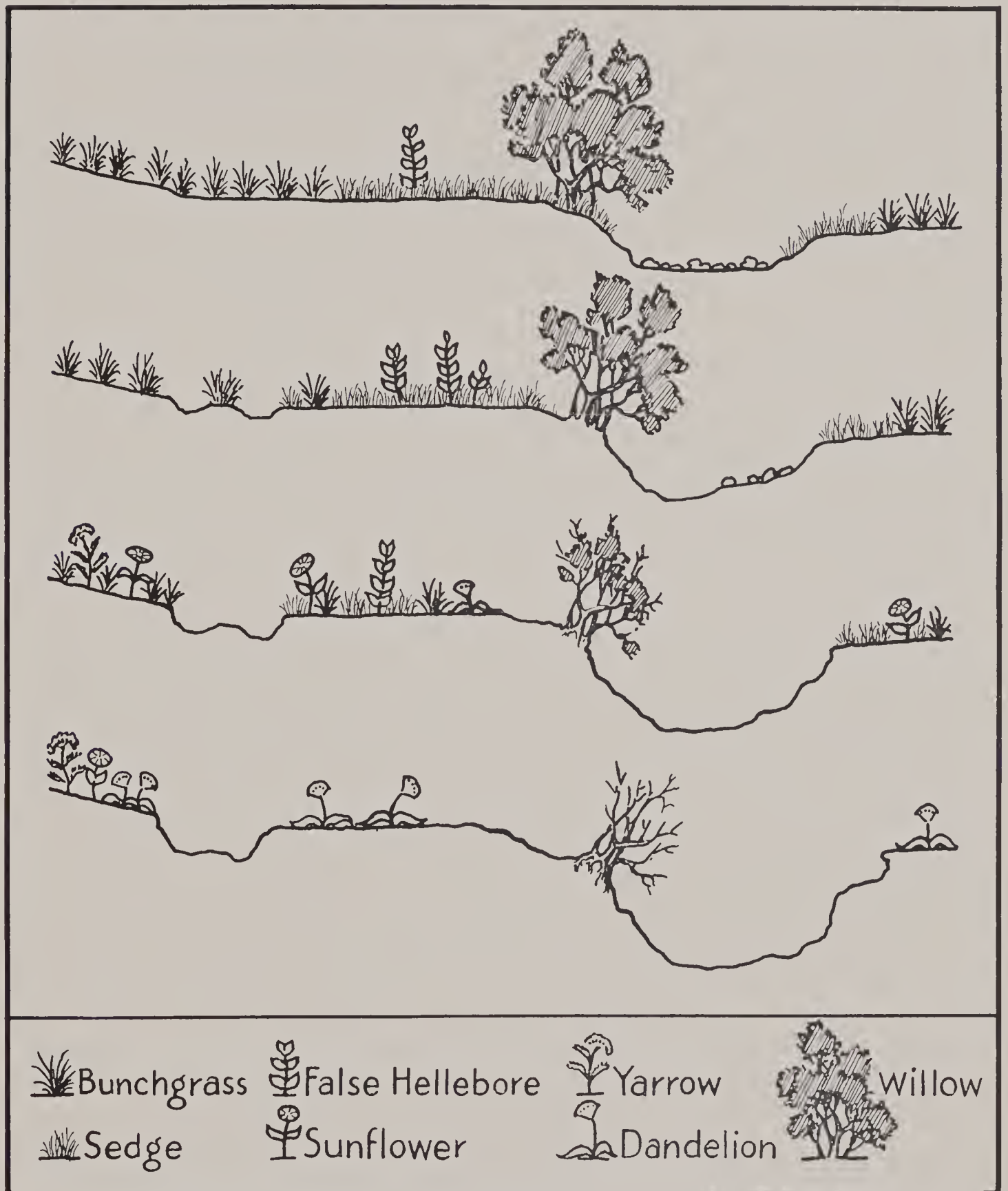


Figure 7.—TYPICAL STAGES OF BREAKDOWN IN MEADOW TYPES



## DRY SITES.

The original plants on the drier mountain ranges were principally bunchgrasses with high grazing capacity and valuable as fattening foods for cattle.

Under heavy grazing, deep-rooted perennial herbs and shrubs replace the bunchgrasses. These include sagebrush, needlegrass and woolly mules-ears. Grazing capacity remains fairly high and these are good fattening feeds for either cattle or sheep.

As heavy grazing continues and the fertility of the soil decreases further, there enter such species as Pentstemon, yarrow, sweetsage, parsley, and other perennial weeds. The grazing capacity is medium-to-low in quantity and quality. It is best for sheep but matures early. Finally, heavily grazed areas on which the soil is seriously impaired support annual weeds only, such as lambsquarters, knotweed, Collomia, tarweed, and mustard. These species mature very early. The grazing capacity is low with value only for sheep and only for an early season. Such areas should be closed to grazing.

## JUNIPER-SAGEBRUSH—WHEATGRASS.

The original composition of this eastside type consisted of wheatgrass, Idaho fescue, Sandberg bluegrass, ryegrass, bitterbrush, chokecherry, serviceberry, woolly mules-ears, lupine, and much less sagebrush than now, except perhaps on the poorest soils. The grasses made up a large proportion of the stand. Overuse caused the wheatgrass and Idaho fescue to disappear in most areas.

Good wheatgrass stands are now often limited to areas far from water, rough lands, and rims where protected by slide rock. Sandberg bluegrass, with its ability to withstand heavy use, because of very early maturity, is the main perennial bunchgrass left that is relatively abundant. There has been an enormous increase in the amount of unpalatable species. The introduced annual, downy chess, has taken over the open soil on low- and medium-elevation ranges. On ranges where overgrazing is of long standing, the cover is reduced to downy chess and sagebrush; if fires have been common, to downy chess alone.

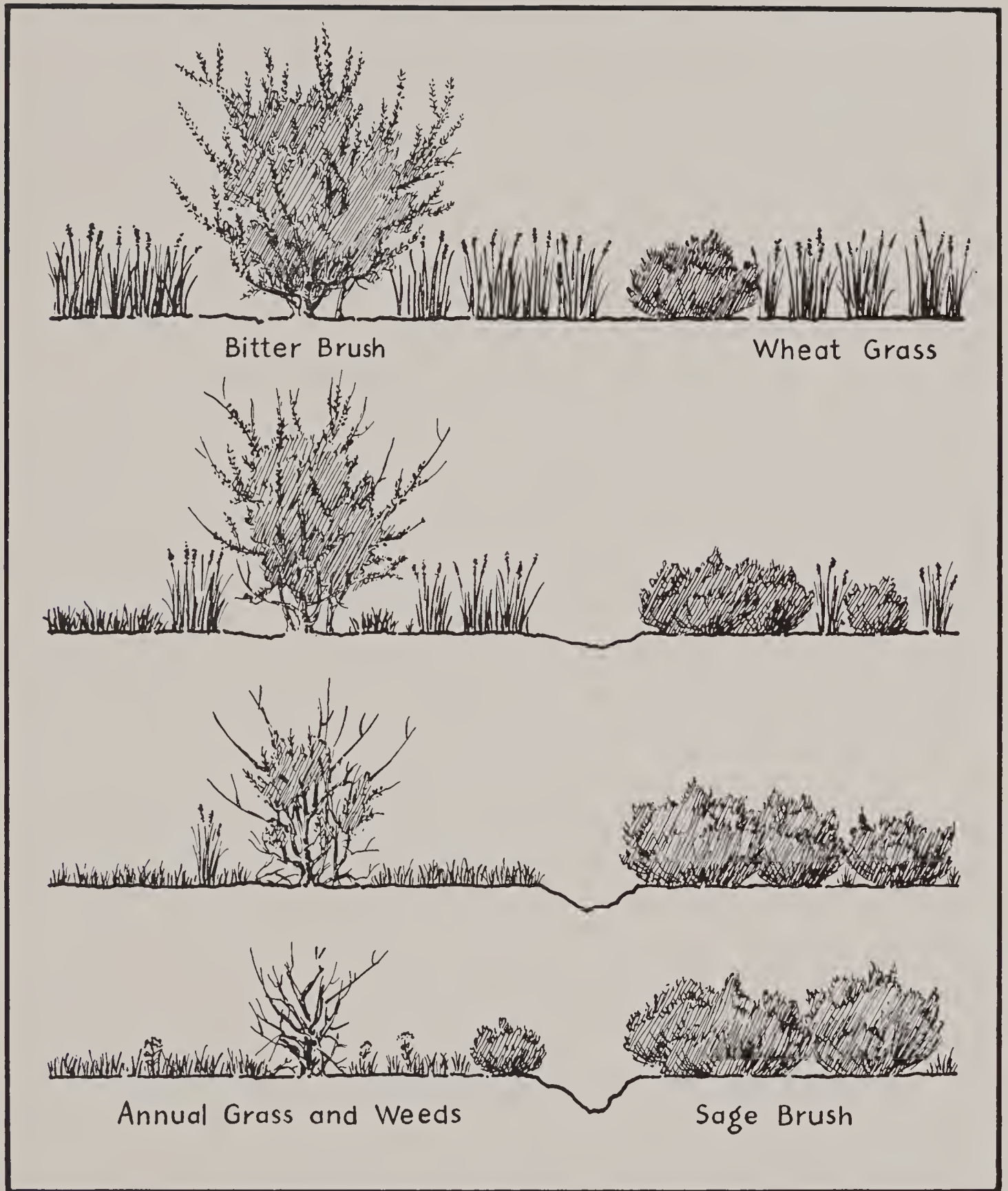


Figure 8.—DETERIORATION ON A BITTERBRUSH RANGE

## SUBALPINE—WEED GRASS.

A climax type of variable composition common to slopes between the upper limits of the red fir and timber line. It consisted originally of mountain brome, bluegrass, oniongrass, junegrass, lupine, woolly mules-ears, mountain dandelion, Brewer's angelica, larkspur, butterweed, coyote mint, bitter cherry and huckleberry oak.

The type was essentially bunchgrass with a mixture of weeds and browse. It was the most valuable grazing area in the Sierra. Before the creation of the National Forests, overgrazing and erosion wrought havoc with many of these excellent ranges. Bunchgrasses were reduced to a remnant. Woolly mules-ears increased enormously and became the most abundant plant in the type; sagebrush where present became common. Today instead of a bunchgrass range we often have a type made up of less palatable weeds and browse.

## MARKS OF RANGE BREAK-DOWN

The intimate and invariable interdependence of plant and soil on each other explains the fact that use of the range, even under the most effective controls, is at best a precariously balanced compromise. Relatively small changes in season of use, in number of livestock, in handling on the range, mean the difference between substantial maintenance of the existing range species and types, and the progressive damage to soil and useful species alike.

Any use means some changes in vegetation. These are, in general, not too serious if range use is stopped at a point before the soil is damaged and erosion processes set up.

### IN THE SOIL

The process of soil removal by action of wind or water is called erosion. Where the resulting soil loss is more rapid than soil formation, it is called *accelerated* erosion. This occurs in nature in badlands and deserts, but in the national forests accelerated erosion is seldom naturally present.

#### Forms of Erosion

The types of accelerated erosion are:

##### *Sheet erosion*

Rather even removal of topsoil over an area, through the action of wind or water. It is indicated by at least partial absence of dark-colored topsoil and by the prevalence of light colors on surface.

##### *Gully erosion*

Formation of deeper channels, which in turn leads to the formation of gullies and canyons.



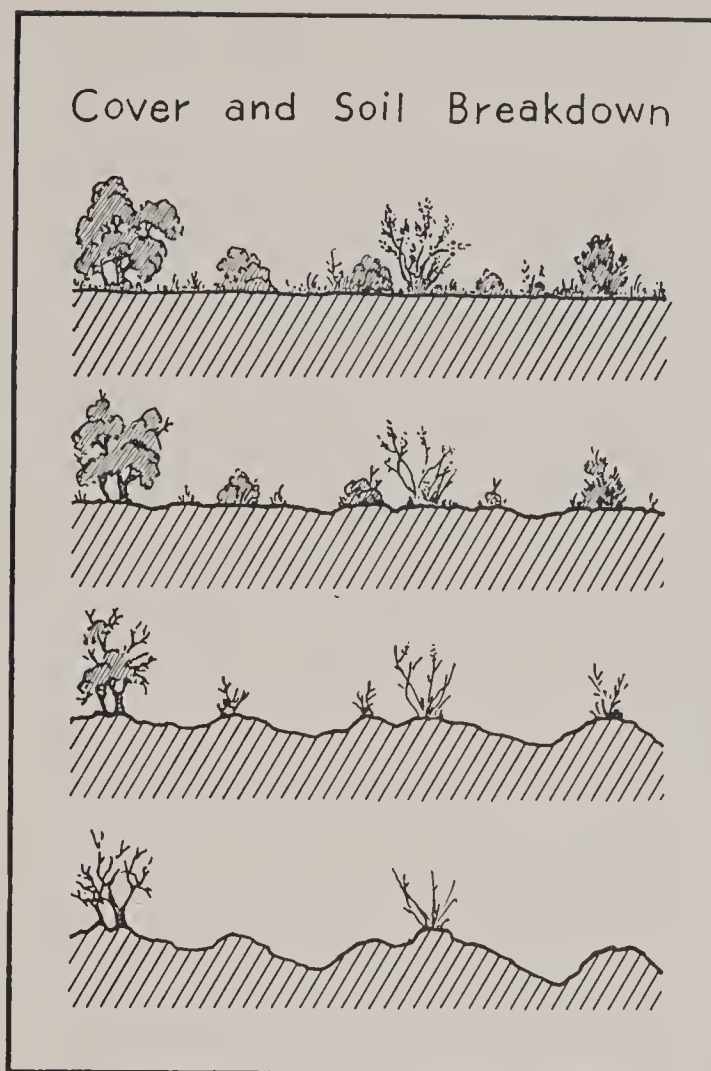


Figure 9.—COVER AND SOIL BREAKDOWN

Cover and soil breakdown must be recognized in its early stages if we are to escape serious results.

### *Stream bank erosion*

The breaking down of stabilized banks. Caused by trampling of livestock, by removal of vegetation by heavy grazing, by washing and undercutting by the stream in flood stage, and by combination of these factors. An intensification of other existing forms.

### *Landslides*

Caused by geological processes or oversaturation of underlying ground strata.

### *Soil creep*

The slow movement of surface soil downhill, caused by the pushing effect of livestock trampling. A speeding-up of the normal process.

### **Relative Susceptibility of Different Sites**

1. Other conditions being the same in this semiarid region, south slopes erode more readily than other aspects. The intense, long-continued sun and heat causes the soil to dry out more rapidly and to greater depth. It thus supports a thinner plant cover than on other aspects. The cover forms litter, humus, and topsoil slowly, and soil formation is thus slow. The resulting thinner soil with thinner plant cover is more quickly disturbed.

2. Other conditions being the same, plant types producing denser cover

and litter erode the least ; soil surface is better protected against water and wind ; the soil is better bound by plant roots.

3. Steeper slopes erode more than gentle ones, since water moves more rapidly.

4. Fine soils generally erode more rapidly than coarse soils, yet this factor has violent exceptions and seldom is dominant. Water penetrates more rapidly in coarse soils and thus does not flow over the surface.

5. Soils with humus erode less rapidly than those without. The organic matter binds the soil particles and aids percolation.

6. Soils with undisturbed plant cover are best protected because conditions are better for percolation ; so that amount of run-off is reduced, velocity of run-off is reduced, beating effect of rain on bare soil is reduced, and roots bind soil together.

### Marks of Soil Break-down

1. *Barrenness*. Absence or sparseness of plants. May be due to poor soil. Usually due to reduced density of plants.

2. *Gullies*. Without plants on side walls.

3. *Erosion pavement*. Soil surface covered with pebbles, the result of removal of finer soil and concentration of pebbles on surface through sheet erosion. If there is the same proportion of pebbles over an inch below the surface, it is not erosion pavement. (Figure 10.)

4. *Soil color*. Exposed subsoil and alluvial deposit usually show in light colors—grays, yellows and browns.

5. *Fresh alluvial deposits, without plant cover*. Where there is a reduction in the gradient of a water channel, a part of the water-borne load of eroded material is dropped. Stream channel deposits may be present. Absence of plant cover indicates that the process of deposition is active—no time for plants to capture the new soil.

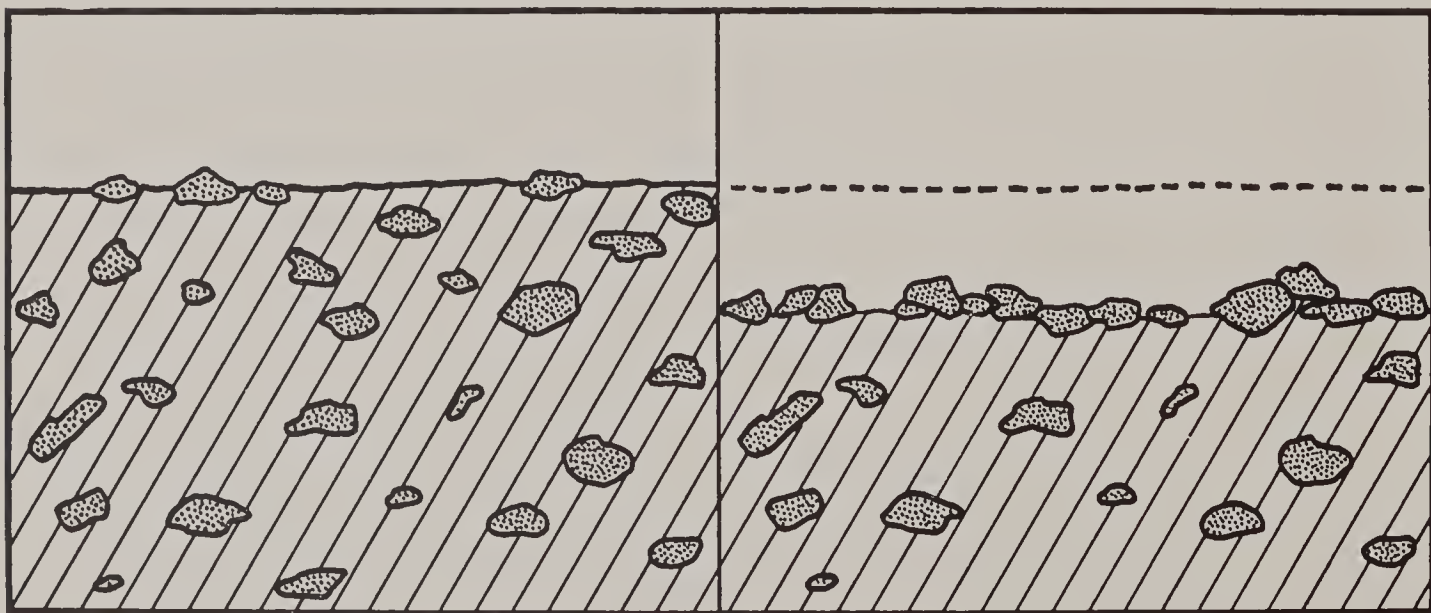


Figure 10.—FORMATION OF EROSION PAVEMENT



6. *Stream bank cutting*. Increased stream velocity undercuts toe of bank at bends.

7. *Dust*. Raised by wind or by animal is an indication that soil surface is not bound or protected by plants. Dust devils or whirlwinds from protected soil contain straws, litter, etc., rather than dust.

8. *Dunes* of fine soil sometimes collect under shrubs; drift from wind erosion.

9. *Shrubs on stools*. Good soil under shrubs. In open spaces between shrubs the soil gritty or pebbly.

10. *Bunchgrasses sitting up on pillars*. (Figure 11.)

11. *Soil humps on slopes* behind grass clumps, fence posts and down logs.

12. *Tree roots exposed*. (Figure 12.)

13. *Old soil line on rocks*. A change of color, noticeable on rocky ground. Lower limit of lichens on rocks has a gap between it and soil surface.

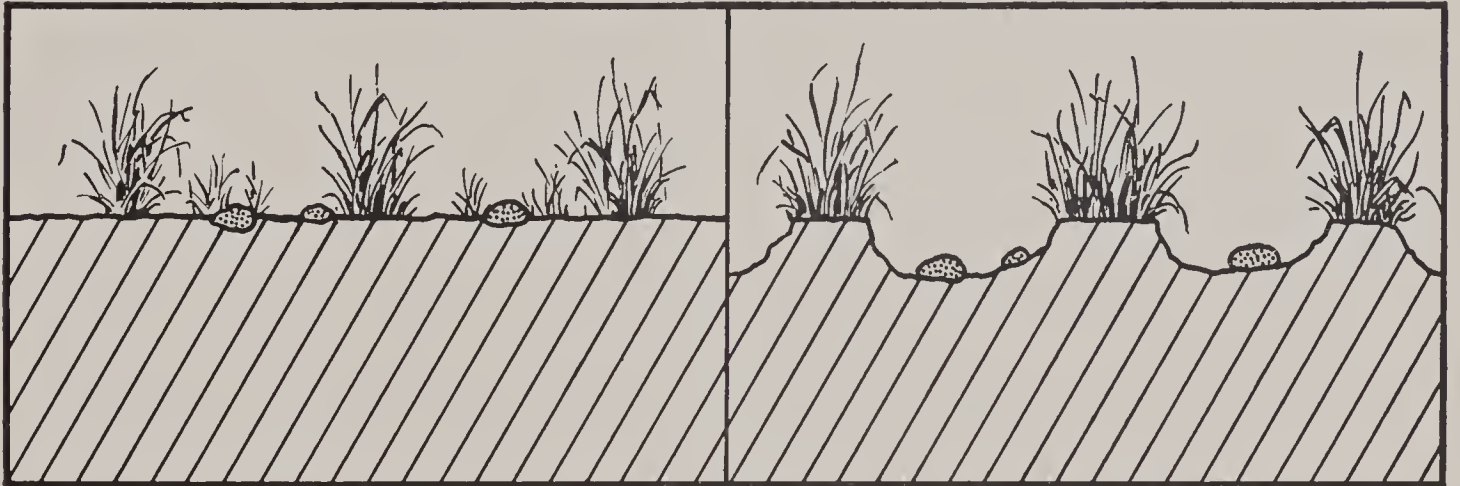


Figure 11.—EROSION: FORMATION OF PEDICELS

Plants may appear to rest on pedicels when unprotected soil around them erodes.



Figure 12.—EXPOSED TREE ROOTS GENERALLY INDICATE THAT EROSION HAS TAKEN PLACE

14. *Roily, muddy, or milky streams.*
15. *Breaks in sod or pot holes* in meadows.
16. *Flood damage* or fresh deposits of alluvial soil below usually indicates active erosion.

### IN THE PLANTS

1. Tall shrubs and small trees show distinct grazing line or browse line—the height to which the grazing animals can reach.
2. Low shrubs browsed down to a rounded hedge or clipped form. Few or no succulent shoots appear above the hedged surfaces of the shrub. Twigs eaten down to from  $\frac{1}{4}$ -inch to  $\frac{1}{2}$ -inch diameter.
3. Dead shrubs of the most favored species; eaten so closely, as under 2 above, that plant dies.
4. Grasses show no flower stalks above closely cropped foliage.
5. Cropping of plants that are not normally eaten.

### IN THE RANGE TYPES

1. Drying out, scarcity or absence of the valuable forage species which should be present.
2. Abundance of plant species indicating range deterioration. See list, pp. 33-34.

## THE IMPORTANT RANGE PLANTS

Next to the soil, the plants are the major element of the range. There are several hundred species on the California mountain ranges, but of these only a few dozen are of widespread or great local importance. The range manager familiar with these species need not worry too much about the numerous other species which individually make up a small part of most ranges. He does need to know, however, three groups:

1. The important useful forage plants.
2. The plants that may be indicative of range deterioration.
3. The poisonous plants.

### THE USEFUL FORAGE PLANTS

These include grasses and grass-like species, both annuals and perennials; weeds; and browse species. The following list gives essential information concerning thirty-three important species.

#### THE GRASSES AND GRASS-LIKE PLANTS

*Name:* Redtop—*Agrostis alba*. (G 9.)<sup>1</sup>

*Region:* All forests.

*Situation:* Prefers wet ground. Wet meadows.

*Reproduction:* Excellent seeder and sod former. Produces an abundance of intertwining rootstocks.

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<sup>1</sup> Symbols refer to pages in Range Plant Handbook.



*Associated plants:* Sedges and rushes, bluegrass, tufted hairgrass, false-hellebore, fernleaf, rein orchid, aster, buttercup.

*Forage value:* Excellent for all kinds of livestock.

*Development stage at opening of grazing season:* Flower heads beginning to show.

*Ability to withstand abuse:* Excellent on good sites; needs good management on less favorable sites.

*Name:* Kentucky bluegrass—*Poa pratensis*. (G 103.)

*Region:* Below 7500 feet all forests.

*Situation:* Favors rich, moist, well-drained soil, characteristic of meadows.

*Reproduction:* Plant produces good seed crop but depends principally on vegetative reproduction by vigorous, slender, creeping rootstocks.

*Associated plants:* Sedges and rushes, redtop, tufted hairgrass, western false-hellebore, fernleaf, rein orchid, aster, buttercup.

*Forage value:* Very good for cattle and horses; good for sheep.

*Development stage at opening of grazing season:* Flower heads beginning to show.

*Ability to withstand abuse:* Phenomenal ability to withstand abuse under most favorable condition of soil and moisture.

*Name:* Soft chess—*Bromus mollis*.

*Region:* Foothills, all forests.

*Situation:* Annual grass—weed and woodland types. Most common grass of the better annual grass types.

*Reproduction:* Good. Abundance of seed produced even in poor seasons.

*Associated plants:* Wild oats, ripgut, red brome, annual fescue, tarweed, knotweed.

*Forage value:* Good feed when green. Dry feed limited in nutritive value.

*Development stage at opening of grazing season:* Two inches high on poor sites; four inches high on moderate to good soils.

*Ability to withstand abuse:* These annual grass types have taken over the original bunchgrass types. Annual grasses will reproduce under abuse. The critical factor is in soil. Where soil is impoverished due to erosion and lack of humus replenishment, the volume of feed produced is very low.

*Name:* Mountain brome.—*Bromus carinatus*. (G 33.)

*Region:* Widespread—all forests.

*Situation:* Wide range situations; prefer moderately rich, well-drained soils, but is also found on fairly dry sites.

*Reproduction:* Spreads only from seed. Conservative use necessary if seedlings are to become established and thrive.

*Associated plants:* Needlegrass, oniongrass, malpais bluegrass, woolly mule-ears, lupine, butterweed, bear-clover, deerbrush, manzanita.

*Forage value:* Good all kinds of livestock during growing season. Becomes harsh and fibrous after maturity.

*Development stage at opening of grazing season:* Flower heads beginning to show.

*Ability to withstand abuse:* Poor. Bunches small; easily damaged.

*Name:* Sandberg bluegrass—*Poa secunda*. (G 106.)

*Region:* Eastside Inyo, Mono, Modoc, Lassen, Plumas and Tahoe forests.

*Situation:* Principally sagebrush-juniper and dry bluegrass meadows.

*Reproduction:* Poor. Seed low viability; bunchgrass; no vegetative reproduction.

*Associated plants:* Wheatgrass, Idaho fescue, Nevada bluegrass, woolly mules-ears, buttercup, sagebrush, bitterbrush, mountain-mahogany.

*Forage value:* Excellent during growing season; fair from midseason to beginning of fall rains. Makes good growth again in fall if moisture and temperature favorable.

*Development stage at opening of grazing season:* Makes very early development. Small proportion of seed heads should be in full flower.

*Ability to withstand abuse:* Good. Sandberg bluegrass makes growth and matures seed early in season. Lies dormant during drought. If it were not for these qualities it would have disappeared on most ranges.

*Name:* Wild oat—*Avena fatua*. (G 23.)

*Region:* Widespread. Foothills around Great Valley and in southern California.

*Situation:* Great variety of soils. Usually well drained; fairly fertile. Has taken over original bunchgrass areas.

*Reproduction:* Good.

*Associated plants:* Soft chess, red brome, annual fescue, filaree, bur-clover, poison-oak, yerba santa, blue oak, manzanita.

*Forage value:* Produces an abundance of forage and is highly palatable until seeds start to form. Dry forage has low nutritive value. However, is consumed with new growth that starts with fall rains.

*Development stage at opening of grazing season:* 4 to 8 inches high.

*Ability to withstand abuse:* Good. Good seed production. Viable seed, annual, makes quick growth, seeds mature early.

*Name:* Idaho fescue—*Festuca idahoensis*. (G 58.)

*Region:* Eastside, Inyo, Mono, Tahoe, Plumas, Lassen and Modoc forests.

*Situation:* Most common on fairly dry, well-drained, moderately deep, sandy or gravelly loams.

*Reproduction:* Fair. Viability of seed fair. Seedlings cannot become established and grow on overstocked ranges.

*Associated plants:* Wheatgrass, Nevada bluegrass, dryland sedge, Sandberg bluegrass, needlegrass, woolly mules-ears, lupine, sagebrush, yellowbrush, bitterbrush.



*Forage value:* Relished by all kinds of livestock during growing season. Poor for sheep when dry. Good fall feed for horses and cattle.

*Development stage at opening of grazing season:* Seed heads beginning to show.

*Ability to withstand abuse:* Good, but plant will disappear under continued heavy use.

*Name:* Bluebunch wheatgrass—*Agropyron spicatum*. (G 6.)

*Region:* Eastside forests.

*Situation:* Ponderosa pine fringes and juniper-sagebrush types. Is drought-resistant and usually found on dry soils.

*Reproduction:* Fair.

*Associated plants:* Nevada bluegrass, Idaho fescue, Sandberg bluegrass, downy chess, sagebrush, bitterbrush, chokecherry, mountain-mahogany.

*Forage value:* Fairly good for all kinds of livestock during growing season. Value much reduced after plant becomes dry. Good winter feed where available.

*Development stage at opening of grazing season:* Leaves 6 to 8 inches long.

*Ability to withstand abuse:* Wheatgrass is easily damaged. Reproduction does not occur except on conservatively grazed ranges.

*Name:* Western needlegrass—*Stipa occidentalis*. (G 117.)

*Region:* Widespread all forests.

*Situation:* Wherever original cover has been disturbed. Overgrazed ranges.

*Reproduction:* Good seeder and awns serve to drive seeds into soil. New plants become established except on badly overstocked areas. Needlegrass is aggressive and is an invader of wheatgrass and bluegrass types.

*Associated plants:* Wheatgrass, Sandberg bluegrass, Idaho fescue, woolly mules-ears, lupine, sagebrush, yellowbrush.

*Forage value:* Good for cattle and horses during growing season; poor for sheep. Of little value after mature.

*Development stage at opening of grazing season:* Flower heads showing; foliage 3 to 5 inches high.

*Ability to withstand abuse:* Good.

*Name:* Wire rush—*Juncus balticus*. (GL 14.)

*Region:* All forests.

*Situation:* Moist areas; wet meadows; streambanks; shallow reservoirs.

*Reproduction:* Good. Plant spreads through medium vigorous underground stems.

*Associated plants:* Sedge, redtop, bluegrass, tufted hairgrass, barleygrass, fernleaf, rein orchid, western false-hellebore, cinquefoil, aster, willow, aspen, alder.

*Forage values:* The small narrowleaf rushes have excellent forage value. Coarse rushes fairly good when green; worthless when dry.

*Development stage at opening of grazing season:* When associated grasses have flower heads showing.

*Ability to withstand abuse:* Excellent. Can stand more abuse than associated grasses and narrowleaf sedges.

*Name:* Bottlebrush squirreltail grass—*Sitanion hystrix*. (G 107.)

*Region:* Widespread; all forests.

*Situation:* Dry sites. On great variety of soils. Comes in whenever original vegetation has been disturbed by fire, logging, overgrazing.

*Reproduction:* Mature seed heads not touched by grazing animals. Wind blows seed heads over range. Seedlings thrive except under severe overstocking.

*Associated plants:* Needlegrass, mountain brome, bluegrass, sagebrush, yellowbrush, woolly mules-ears, knotweed, Gayophytum.

*Forage value:* Fairly good cattle feed before heads develop. Poor sheep feed. Grazed but little after seed heads mature. Second-rate forage species.

*Development stage at opening of grazing season:* Flower heads beginning to show.

*Ability to withstand abuse:* Excellent. Very aggressive. Unless range badly overstocked, animals will not graze closely.

*Name:* Sedges—*Carex* spp. (GL 1.)

*Region:* Widespread; all forests.

*Situation:* Does well on moderately fertile soils. Wet meadows to open dry hillsides, often forming a distinct zone between dryland vegetation and wet meadow.

*Associated plants:* Rush, redtop, bluegrass, tufted hairgrass, Muhlenbergia, fernleaf, rein orchid, western false-hellebore, aster, cinquefoil, willow, aspen, alder.

*Forage value:* (1) Narrowleaf : moist site sedge ; excellent forage, continues to push forth new growth all season ; highly nutritious  
(2) Broadleaf : swamp site sedges ; practically worthless  
(3) Threadleaf : dryland sedge ; valuable forage early in season ; produces heavy sod ; excellent soil cover.

*Reproduction:* (1) Very good under proper use  
(2) Very good under conservative use  
(3) Good under proper use, but when sod is broken is extremely difficult to reestablish.

*Development stage at opening of grazing season:*

- (1) Wet meadow, when associated grasses have flower heads showing and ground is firm
- (2) Broadleaf sedge, as above
- (3) Dryland sedge, after brown flower heads make their appearance.

*Ability to withstand abuse:*

- (1) Wet meadow, will stand very heavy use
- (2) Broadleaf sedge, not damaged as very poor forage
- (3) Dryland sedge, excellent but continued overgrazing will break up sod.

## THE WEEDS

*Name:* Woolly mules-ears—*Wyethia mollis*. (W 207.)

*Region:* Ponderosa pine and subalpine weed browse types on all except four southern California forests.

*Situation:* Well-drained soils, exposed ridges, dry open slopes and flats within ponderosa pine and red fir belts to 9000 feet. Thrives best under eastside conditions.

*Reproduction:* Good in spite of fact seedheads commonly infested with insect larvae.

*Associated plants:* Mountain brome, needlegrass, oniongrass, lupine, butterweed, larkspur, waterleaf, sagebrush, bitterbrush, snowberry.

*Forage value:* Leafage only slightly grazed. Flowers relished by cattle and sheep.

*Development stage at opening of grazing season:* Full flower.

*Ability to withstand abuse:* Good.

*Name:* Tailcup lupine—*Lupinus caudatus*. (W 114.)

*Region:* Eastside ponderosa pine belt and subalpine weed browse type on Sequoia, Sierra, Stanislaus, Eldorado, Tahoe, Plumas, Lassen, Modoc, Mono, Inyo and Shasta forests.

*Situation:* Well-drained soils from the sagebrush type to open coniferous timber stands high elevations.

*Reproduction:* Good.

*Associated plants:* Mountain brome, bluegrass, needlegrass, oniongrass, butterweed, woolly mules-ears, waterleaf, knotweed.

*Development stage at opening of grazing season:* Lower leaves fully developed; flower stalks prolonging; flowers in bud.

*Forage value:* Good, all kinds of livestock; late after pods break open.

*Ability to withstand abuse:* Because of deep taproot, able to withstand heavy use.

*Name:* Sawtooth butterweed—*Senecio serra*. (W 173.)

*Region:* 3000 to 7000 feet ponderosa and subalpine zones on all except four southern California forests.

*Situation:* Characteristic of moist but well-drained, rich, sandy or gravelly loams, but sometimes on drier sites.

*Reproduction:* Good. Seeds are tipped with hairs—wind disseminated.

*Associated plants:* Mountain brome, bluegrass, needlegrass, oniongrass, lupine, woolly mules-ears, larkspur, waterleaf.

*Forage value:* Fairly good for sheep; only poor to fair for cattle.



*Development stage at opening of grazing season:* In full flower.

*Ability to withstand abuse:* Good. On moderately grazed ranges this quality of plant not severely tested, as palatability of plant quite low.

*Name:* Clover—*Trifolium* spp. (W 190.)

*Region:* All forests.

*Situation:* Moist sites in wet meadows and along streams; good soils.

*Reproduction:* Clover reproduces well if type correctly grazed but is one of first plants to disappear under overgrazing.

*Associated plants:* Sedges and rushes, bluegrass, redtop, meadow barley-grass, aster, western false-hellebore, fernleaf, cinquefoil, willow and alder.

*Forage value:* Excellent for both sheep and cattle.

*Development stage at opening of grazing season:* When the grasses have flower heads showing and soil is firm.

*Ability to withstand abuse:* High. Good soil and moisture conditions enable plants to stand good deal of abuse.

*Name:* American vetch—*Vicia americana*. (W 203.)

*Region:* Widespread, all forests.

*Situation:* Wide range in elevation—brush and timber types.

*Reproduction:* Fair.

*Associated plants:* Manzanita, whitethorn, bear-clover, deerbrush, lupine.

*Forage value:* Excellent for all kinds of livestock.

*Development stage at opening of grazing season:* Blossoms fully developed.

*Ability to withstand abuse:* Because plant usually grows in shade of brush, a fair percentage of plants escape grazing and perpetuate species.

*Name:* Ballhead waterleaf—*Hydrophyllum capitatum*. (W 98.)

*Region:* From foothills to alpine belt, most common medium elevations. Not significant on four southern California forests; common on all others.

*Situation:* Occupies fertile, semi-shaded types bordering woodlands, often stands of aspen and yellow pine, in canyon bottoms and brushy hillsides.

*Reproduction:* Poor.

*Associated plants:* Mountain brome, bluegrass, needlegrass, wheatgrass, butterweed, larkspur, lupine, sagebrush, aspen, alder and willow.

*Forage value:* Excellent, though plant is drying on many ranges before livestock can be admitted.

*Development stage at opening of grazing season:* In full flower.

*Ability to withstand abuse:* Good because of early development of plant and early maturity of seeds.

*Name:* Smooth mountain-dandelion—*Agoseris glauca*. (W 10.)

*Region:* Both above and below ponderosa pine belt. Not important on southern California forests.



*Situation:* Nearly all variations of soil and moisture conditions, but most common on moderately dry flats, hillsides, and meadows.

*Reproduction:* Good. Seed disseminated by wind.

*Associated plants:* Mountain brome, needlegrass, woolly mules-ears, lupine, butterweed.

*Forage value:* Moderately grazed by cattle; relished by sheep.

*Development stage at opening of grazing season:* Leaves fully developed.

*Ability to withstand abuse:* Good. Vigorous taproot.

*Name:* Alfileria—*Erodium cicutarium*. (W 74.)

*Region:* Annual grass types; foothills on all forests.

*Situation:* Grows well on variety of soils—waste lands and denuded areas.

*Reproduction:* Excellent if enough seeds left to be readily visible on soil surface.

*Associated plants:* Soft chess, red brome, ripgut, wild oats, bur-clover, tarweed, pop-corn flower.

*Forage value:* Excellent feed for cattle and sheep when green; little forage value when completely dry.

*Development stage at opening of grazing season:* 2 inches high on moderately good soil.

*Ability to withstand abuse:* Remarkable, but as soil becomes poorer volume of feed produced diminishes to negligible amount.

*Name:* Aster and wild daisy—*Aster* and *Erigeron* spp. (W 31 and W 67.)

*Region:* Widespread, all forests.

*Situation:* Meadows and stringer types.

*Reproduction:* Good.

*Associated plants:* Sedges and rushes, tufted hairgrass, pentstemon, cinquefoil, buttercup, willow.

*Forage value:* Fair for cattle and sheep; definitely second-rate forage plants.

*Development stage at opening of grazing season:* Lower leaves fully developed; flower stalks in evidence. Flowers in bud.

*Ability to withstand abuse:* Seed production good and most asters spread from underground rootstocks.

*Name:* Pentstemon—*Pentstemon confertus*. (W 144.)

*Region:* Moderate to high elevation in Sierra forests—Sequoia, Sierra, Stanislaus, Eldorado, Tahoe, Plumas, Lassen, Modoc and Shasta.

*Situation:* Semi-wet meadows and hillside type in moderately fertile soil.

*Reproduction:* Poor.

*Associated plants:* Sedges and rushes, oatgrass, aster, cinquefoil.

*Forage value:* Only fair for cattle and sheep.

*Development stage at opening of grazing season:* Full development lower leaves; flowers in bud.

*Ability to withstand abuse:* Good. Plant is weak seeder but has very strong root system and spreads by underground stems.

### THE BROWSE

*Name:* Deerbrush—*Ceanothus integerrimus*. (B 44.)

*Region:* West slope of the Sierra; Sequoia, Sierra, Stanislaus, Eldorado, Tahoe, Plumas, Lassen and Shasta, Klamath and Trinity forests.

*Situation:* Well-drained, moderately fertile soils.

*Reproduction:* Good but only after fires. Seeds need heat treatment. Natural reproduction in areas not burned is poor.

*Associated plants:* Whitethorn, numerous annual weeds, plants associated with stringer types along creeks, sedges and rushes, lupine, butterweed.

*Forage value:* Very high first half of grazing season. Rapid decline after maturity of seeds, about August 15.

*Development stage at opening of grazing season:* Beginning of blossoming.

*Ability to withstand abuse:* Remarkable ability to withstand heavy grazing if permitted a start for first two years after establishment.

*Name:* Bitterbrush—*Purshia tridentata*. (B 116.)

*Region:* East slope Sierra; Modoc, Shasta, Lassen, Plumas, Tahoe, Mono and Inyo forests.

*Situation:* Well-drained, sandy, gravelly or rocky soils on open southerly exposure.

*Reproduction:* Poor. Cannot reproduce on overgrazed ranges.

*Associated plants:* Wheatgrass, Sandberg bluegrass, Idaho fescue, woolly mules-ears, sagebrush, waterleaf, annual grasses and weeds on former bunchgrass types.

*Forage value:* Relished by all kinds of livestock and deer. Use heaviest mid-summer to end of grazing season. On some sites, such as pine types on Inyo, has little forage value.

*Development stage at opening of grazing season:* Beginning of blossoming.

*Ability to withstand heavy use:* Remarkable.

*Name:* Bitter cherry—*Prunus emarginata*. (B 115.)

*Region:* Widespread, all forests.

*Situation:* Prefers well-drained, moderately fertile but stony sites, on open slopes and ridge tops.

*Reproduction:* Good.

*Associated plants:* Grasses in wide range of types. Huckleberry oak, white-thorn, manzanita, serviceberry, woolly mules-ears, mountain-dandelion, lupine, waterleaf.

*Forage value:* Fair for cattle and fairly good for sheep. Consumed in late season when highly palatable, after other forage largely consumed.

*Development stage at opening of grazing season:* In bloom; leaves full size.

*Ability to withstand abuse:* If general types in which shrub occurs are not

badly overgrazed, bitter cherry will be in satisfactory condition on account of only fair palatability.

*Name:* Common serviceberry—*Amelanchier alnifolia*. (B 12.)

*Region:* Widespread, all forests.

*Situation:* Wide range of conditions, ranging from rocky slopes in full sunlight to shade of coniferous timber and to deep fertile soils in aspen and lodgepole types.

*Reproduction:* Good.

*Associated plants:* Mountain brome, junegrass, oniongrass, woolly mules-ears, lupine, butterweed.

*Forage value:* Good for cattle, sheep and deer. Is taken principally after midseason.

*Development stage at opening of grazing season:* Full flower and leaf development.

*Ability to withstand abuse:* Withstands close use remarkably well.

*Name:* Willow—*Salix* spp. (B 141.)

*Region:* Widespread, all forests.

*Situation:* Along streams, shorelines of lakes, moist bottom lands, mountain meadows and slopes.

*Reproduction:* Very poor on overgrazed wet meadow types.

*Associated plants:* Sedges, rushes, redtop, bluegrass, false-hellebore, aster.

*Forage value:* Most species fair for cattle, good for sheep, late summer feed.

*Development stage at opening of grazing season:* Full leaf.

*Ability to withstand abuse:* Scattered clumps quite easily injured.

*Name:* Mountain snowberry—*Symphoricarpos oreophilus*. (B 151.)

*Region:* Widespread, all forests.

*Situation:* Wide range situations, low elevations to high in well-drained soils.

*Reproduction:* Good under moderate use.

*Associated plants:* Mountain brome, needlegrass, lupine, aster, pentstemon, woolly mules-ears, aspen and willow.

*Forage value:* Good for cattle and sheep; excellent deer feed.

*Development stage at opening of grazing season:* Leaves full size.

*Ability to withstand abuse:* Able to withstand fairly heavy use. Usually, in types where snowberry is found, grasses and palatable weeds will be overutilized before this stage of use is reached in snowberry.

*Name:* Western chokecherry—*Prunus demissa*. (B 114.)

*Region:* Widespread, all forests.

*Situation:* Usually occurs on deep, rather fertile, sandy soils, but does quite well on rock talus slopes and about rim rocks.

*Reproduction:* Good.

*Associated plants:* Sandberg bluegrass, sedge, annual grasses and weeds, sagebrush, woolly mules-ears.



*Forage value:* Only fair for cattle and sheep. Leafage poisonous if taken in large amounts.

*Development stage at opening of grazing season:* Full development of leaves and flowers.

*Ability to withstand abuse:* Good.

*Name:* Western aspen—*Populus tremuloides*. (B 111.)

*Region:* Widespread, all forests.

*Situation:* Best development on rich, moist, loam soils, but also occurs in wet soils and on dry, gravelly hillsides.

*Reproduction:* Good by sprouting.

*Associated plants:* Mountain brome, sedges and rushes, bluegrass, false-hellebore, lupine, geranium, meadowrue, cow-parsnip.

*Forage value:* Good, both cattle and sheep. Excellent for deer—both green and fallen leaves.

*Development stage at opening of grazing season:* Leaves three-fourths developed.

*Ability to withstand abuse:* Poor; does not reproduce from seed; on heavily grazed ranges sprout growth cannot get above grazing height.

*Name:* Whitethorn—*Ceanothus cordulatus*. (B 40.)

*Region:* Ponderosa pine, mixed conifer, and red fir stands on west slope Sierra; Sequoia, Sierra, Stanislaus, Eldorado, Tahoe, Plumas, Lassen, Shasta, Mendocino and Trinity forests.

*Situation:* Wide variety well-drained soils in open and in shade coniferous timber; especially abundant on burns and cut-over.

*Reproduction:* Excellent.

*Associated plants:* Green manzanita, huckleberry oak, bitter cherry, knotweed, Gayophytum.

*Forage value:* Poor to fair.

*Development stage at opening of grazing season:* Beginning to blossom.

*Ability to withstand abuse:* Palatability low, but is taken when range is overstocked.

*Name:* Birchleaf-mahogany—*Cercocarpus betuloides*. (B 51.)

*Region:* Dry slopes canyons and mountains 500 to 4000 feet, all forests.

*Situation:* Hot canyon slopes; well-drained slopes.

*Reproduction:* Excellent.

*Associated plants:* Annual grasses and weeds, poison-oak, whiteleaf manzanita, yerba santa, blue oak.

*Forage value:* Fair for cattle; good for sheep and deer.

*Development stage at opening of grazing season:* Full leaf development.

*Ability to withstand abuse:* Good.

*Name:* Brewer oak—*Quercus breweri*. (B 117.)

*Region:* Coast Range, Mendocino and Trinity forests.

*Situation:* High ridges—south and west slopes.

*Reproduction:* Good.

*Associated plants:* California fescue, mountain brome, malpais bluegrass, waterleaf, annual grasses and weeds.

*Forage value:* Poor to fair for cattle; fair for sheep.

*Development stage at opening of grazing season:* Leaves three-fourths developed.

*Ability to withstand abuse:* Oak browse will withstand abuse that will destroy associated grasses and weeds.

## THE INDICATORS OF DETERIORATION

Since all plants were found some place under natural conditions, their presence or abundance cannot always be used as a definite indicator of range condition. Observing the following species may assist measurably in recognizing disturbed conditions.

Downy chess—*Bromus tectorum*. (G 38.)

This plant was introduced from Europe and has spread over the eleven western States. It is found chiefly on eastside forests in California. On types that are in good condition it cannot compete with native perennials. However, on overgrazed juniper-sagebrush and grassland types, it has taken over the soil laid bare by destructive grazing. The presence of this grass is good evidence of past abuse.

Types which now contain a large amount of this grass are a difficult management problem. If full use is to be made of downy chess, the remaining perennial grasses are grazed before they are ready in early season and are grazed to the root crown before a fair percentage of the downy chess is eaten. On ranges where the policy is to reestablish the bunchgrasses, it is necessary to disregard the downy chess in setting the proper season and grazing capacity. This does not mean that no use will be made of downy chess, but that proper utilization will be based on the bunchgrasses.

Western false-hellebore—*Veratrum californicum*. (W 201.)

Tall, robust herb, with unbranched leafy stems arising from a short, thick rootstock. It occurs exclusively on moist soils in the mountainous regions. Where meadows and stringer types are in excellent condition, western false-hellebore grows in small groups or single. In overgrazed meadows where the meadow grasses and sedges have been destroyed and gullying has reduced the moisture content of the soil, western false-hellebore takes over the type.

Dense patches of western false-hellebore are often indicative of the past overgrazing of a good meadow type. In the Sierra there are great numbers of meadows that produce practically nothing but western false-hellebore. The only way that these meadows can be restored is through very conservative use or nonuse and by erosion control structures to raise the water level.



Tarweed—*Hemizonia wrightii*.

This plant belongs to the sunflower family and has pungently-scented, sticky herbage. On the national forest ranges they are aggressive and are rarely eaten by livestock; hence have an advantage over good forage plants of the annual grass types. Our perennial grass types in satisfactory condition contain very little tarweed. Where overgrazing has decimated the good forage plants, tarweed may become abundant. The amount of tarweed present is not necessarily an indicator of the condition of an annual grass type. Cattle may graze it closely in the early stages of growth, particularly on the winter ranges outside the national forests.

Turkey Mullein—*Eremocarpus setigerus*.

Found generally on closely grazed areas or in fallow fields. It is most common in annual grass types and on denuded meadows. When abundant on range lands it is a good indicator of extreme abuse. Ranges which have reached this stage of denudation have very little grazing capacity. Elimination of livestock grazing may be advisable in order to give the type full opportunity to improve.

Knotweed—*Polygonum* spp. (W 154.)

Various species of *Polygonum* in quantity are generally indicators of depletion or disturbed conditions, i.e., conditions which prevent the maintenance of the highest and most stable forage types. Found in overgrazed types from the valley floor to timber line. There is, however, something to be said in their favor. If such ranges are conservatively stocked these plants will succeed eventually in building up organic matter in the soil to a point where it can support more desirable perennial plants.

Red brome—*Bromus rubens*.

Red brome is an annual grass introduced from Europe. An abundance of this grass indicates a type which is low in the scale of succession in annual grass types. Red brome types are usually the result of severe overgrazing or fire coupled with erosion which has resulted in the removal of the topsoil.

Woolly mules-ears—*Wyethia mollis*. (W 207.)

In the gradual elimination of bunchgrasses by overgrazing, perennial weeds fill the gaps and increase in abundance. These weeds are aggressive, being good seeders and having strong root systems, and are not readily grazed by livestock. The most important plant of this kind in ponderosa pine, sagebrush and subalpine weedgrass types is woolly mules-ears. It has come to be the most conspicuous plant of the types mentioned above. A change from woolly mules-ears to grasses is indicative of improvement and the reverse is indicative of deterioration.

Buttercup—*Ranunculus* spp. (W 161.)

Buttercup is associated with sedges, rushes and meadow grasses in wet meadow types. If the meadow is in good condition, buttercups are not a noticeable component of the vegetation. Overuse of a meadow which results in gradual disappearance of the palatable forage produces conditions favorable to the growth of buttercups. They are unpalatable, mature very early



in the season, and have a vigorous root system. Abundance in a meadow shows the need for special management to protect the type.

## THE POISONOUS PLANTS

A great many misconceptions have been built up concerning the poisoning of livestock. One of the most common is that range animals will seek out poisonous plants and eat them from preference. This is not true, because without exception poisonous plants are of secondary forage value. Years of experience and research have demonstrated that animals rarely become poisoned when they have an abundance of good forage. It is the hungry animal that is the potential victim of plant poisoning. Serious losses are the result of animals being on the range too early or being on overstocked ranges. On long drives the hungry animals may eat poisonous plants with disastrous results. This being the case, the obvious remedy is to take such care of the animals that they will not be tempted to eat poisonous plants. When poisoned animals are found down but still alive, they should always be worked around until their heads are uphill. This permits them to breathe more easily. They should be kept in this position until they are again able to stand, or death ensues.

The following descriptions are given of the most commonly found species:

Sierra larkspur—*Delphinium glaucum*. (W 61.)

*Region and situation:* This tall larkspur occurs chiefly in well-drained, loamy soil in mountain parks, along streams, and in clumps of aspen or in partial shade of conifers. Severe losses from tall larkspur have occurred in the central Sierra forests and in the Klamath Mountains.

*Nature of injury and animals affected:* Although it is possible to poison sheep and horses by forced feeding of larkspur, only cattle are susceptible under range conditions. The great loss of cattle occurs during spring and early summer because larkspur produces an abundance of growth in advance of other plants. A small amount of larkspur may prove fatal at that time. The toxicity becomes less as the season advances and practically disappears with seed maturity.

Early symptoms of poisoning are: The animal's muscles stiffen and the gait becomes irregular; later the front legs give way and the animal falls. If a lethal dose has been consumed, death follows in a very short time.

*Preventive measures:* Cattle should not be turned out until the forage plants have made sufficient growth to furnish ample feed. Other measures are grubbing, fencing and herding.

*Treatment:* Should there be areas where it is desirable to have medical aid available, beneficial results usually are obtained by injecting a solution of 1 grain of physostigmine salicylate, 2 grains pilocarpine hydrochloride, and  $\frac{1}{2}$  grain of strychnine sulphate, with a hypodermic syringe, preferably in the shoulder. The above amount dissolved in approximately 1 tablespoon of water is the proper dose for an animal weighing 500 to

600 pounds. The formula should be doubled for an animal of 1000 pounds. The syringe used in administering blackleg vaccine will serve. This equipment and material may be made available at cow camps where this type of poisoning is prevalent.

Lupine—*Lupinus* spp. (W 112.)

*Region and situation:* Lupine occurs on all California forests. However, losses of livestock by lupine have been confined mainly to the Mono, Lassen, Plumas and Tahoe and to certain species. Considerable field experience is generally necessary to determine and recognize poisonous and non-poisonous species.

*Nature of injury and animals affected:* Cattle, horses and sheep are susceptible to lupine poisoning. On the open range, poisoning of livestock other than sheep is rare. Typical lupine poisoning is characterized by labored breathing, excitement, snorting, convulsions, and occasionally frothing at the mouth. The animals run about in a frenzy and butt against any opposing object. The action of the poison is not cumulative and usually no ill effects result where the animals consume only small amounts.

*Preventive measures:* Although all parts of the lupine may be poisonous, the pods and seeds are three to four times as poisonous as any other part of the plant. Therefore, prevention consists in keeping animals off areas where lupine is abundant from the time seed is forming until it is dispersed. After seed is dispersed, they may be safely grazed and at that time many species are excellent forage.

*Treatment:* There is no effective treatment.

California waterhemlock—*Cicuta californica*. (W 52.)

*Region and situation:* Waterhemlock is, without doubt, the most virulently poisonous flowering plant native to the United States. It occurs along streams, in swamps, ditches, wet meadows, and boggy places.

Waterhemlock is found on all forests in the Region.

*Nature of injury and animals affected:* The symptoms are uneasiness, frothing at the mouth, severe pain, muscular twitchings, a weak intermittent pulse, and dilation of pupils of the eyes. If the dose is fatal, death comes from exhaustion due to severe muscular contraction. The toxic dose for cattle has been roughly estimated as a piece of root the size of a walnut.

Cattle, sheep and horses are all susceptible to waterhemlock poisoning.

*Preventive measures:* Prevention is the only effective control. Handpulling is often the simplest method if pieces of the root are not left behind; grubbing or fencing also have their place. All grubbed or pulled roots must be carefully burned as they are deadly even when dry.

*Treatment:* There is no effective treatment.

Blacklaurel—*Leucothoe davisae*. (B 92.)

*Region and situation:* This shrub prefers moist, shady areas in dense stands



of timber. It is limited to the central and northern Sierra and to the Coast Range on the Mendocino and Trinity.

*Nature of injury and animals affected:* Blacklaurel is of very low palatability and is rarely grazed by cattle or sheep. However, sheep will graze it when hungry, especially when leaving the bedgrounds or on long drives. Limited use is dangerous and 1 to 2 ounces of blacklaurel will kill a sheep. The symptoms are irregular respiration, frothing at the mouth, vomiting, grinding of the teeth, weakness and a staggering gait, and, in severe cases, inability to stand.

*Preventive measures:* The wisest procedure for the sheepman is to instruct his herders to avoid blacklaurel patches, or pass through them when the sheep are full.

*Treatment:* Practically the only remedy is to administer some such purgative as Epsom Salts to expedite the elimination of the poisonous material.

Mexican whorled milkweed—*Asclepias mexicana*. (W 30.)

*Region and situation:* Throughout California, chiefly in dry ground of valleys and foothills. However, it is commonly found in rocky watercourses of eastside streams, particularly streams that become very low in late summer.

*Nature of injury and animals affected:* Cattle and sheep are the only animals affected by milkweed poisoning under range conditions. The symptoms of poisoning in sheep are as follows: They become sick in about 5 to 14 hours and are generally depressed, refuse to eat, lack muscular coordination, and walk with an unsteady, wobbly gait with paralysis usually most marked in the hind legs. The poisoned animals are often salinated and bloated. In fatal cases the affected animals soon fall, unable to rise. The pulse is fast and weak and breathing labored. Spasms are present.

*Preventive measures:* No effective antidote is available. Eradication is not feasible on account of the ability to grow from very small piece of horizontal root. Prevention consists in correctly stocking ranges so that stock are not forced to eat it, and in keeping sheep off heavily infested areas.

Meadow deathcamas—*Zygadenus venenosus*. (W 213.)

*Region and situation:* The various species of deathcamas grow in almost every type of soil and flourish in both dry and moist situations on all forests in the Region. However, of the two most common species in California, one is found in wet meadows, the other in brush types and is especially abundant after fires.

*Nature of injury and animals affected:* The symptoms of deathcamas poisoning are frothing at the mouth, nausea with vomiting, great weakness accompanied sometimes with nervousness and resulting in the collapse of the animal, which may go without feed for hours, or even days, before death.

Cattle are seldom poisoned unless forced to graze on heavily infested areas, where other forage is scarce. Losses are confined to sheep, on early spring and summer ranges.



*Preventive measures:* The only practical defense or control, under range conditions, is to keep the animals off heavily infested areas. On ranges where deathcamas is common, the herder or camp tender should scout the area to be used and avoid infested areas. These areas can be grazed later when deathcamas has dried up and no longer is attractive to sheep.

*Treatment:* There is no effective treatment.

## THE RANGE TYPES

Each important range type has a characteristic composition, a safe opening date for use, readily identified marks of unsatisfactory condition and overuse, and of satisfactory condition and allowable use (the latter are the "utilization standards").

## UTILIZATION STANDARDS

In order to assist the range manager in determining the use of forage that may be allowed and permit a type to maintain a sustained grazing capacity or to improve to a satisfactory condition, standards of utilization (use to be allowed) are herewith set up for the important forage types of the Region.

They are the results of the combined knowledge of forest officers developed through thirty years of range administration.

### BASIC PRINCIPLES

Several principles are especially important in the standards. These are:

1. The soil is the basic resource.
2. The primary objective is to maintain the soil in satisfactory condition, to encourage a trend in that direction.
3. The secondary objective is to maintain the highest grazing capacity consistent with the primary objective.
4. When a satisfactory density of vegetation and litter is present, the soil is usually protected from erosion.
5. *The perennial herbaceous forage plants* are the most important in indicating soil stability and satisfactory condition (except in the foothills).

### CAUTION

It is important to note that "allowable use" as here used applies to the type in satisfactory condition. *It is emphasized that the use to be allowed must decrease as the depletion or unsatisfactory condition increases in severity.*

### HOW TO APPLY

The standards are an aid to more efficient inspection. In their application the user must keep in mind that:

1. Satisfactory condition of the soil and vegetation is a prime objective of all range management. When a type is not already in satisfactory condition, the soil and plant cover should be changing in that direction.

2. The variability of conditions and types prevents the instructions from fitting all situations exactly. Consider the effect of topography, stock water, and forage type on condition and use, and determine what areas or types are "key areas." Then *let the condition and use of the key areas serve as a guide to the management of the allotment.*
3. When inspecting a range, best results will be obtained if first consideration is given to the satisfactory or unsatisfactory condition of the soil and the forage type. Consider next the present season's use and determine whether it has been allowable use or overuse.
4. Allowable use is given only for the satisfactory condition of the type. To provide for rehabilitation, any type in unsatisfactory condition must be used less than allowable use or not at all, depending on the seriousness of the depletion.
5. Allowable use as given in the standards is that degree of use which should be attained at the close of the grazing season. To determine allowable use during midseason, allowance must be made for that portion of the grazing period remaining.
6. The degree of use cannot be determined from a pick-up; it can only be done by more close observance, by walking through portions of the range, or from horseback.
7. A permanent record by allotment should be kept of the conditions observed and recommendations and action taken. See pages 132-141.



## THE WET MEADOW TYPE



### TYPE CHARACTER

Although more common at the higher elevations, wet meadow types are apt to occur on valley bottoms and occasionally on slopes where moisture conditions are favorable. They are characterized by moisture-loving, herbaceous, and sod-forming plants. If the soil is wet through midsummer, the herbaceous cover is principally sedges (GL 1) and rushes (GL 14). Some grasses, as tufted hairgrass (G 48) and mannagrass (G 67), with an interspersed of showy flowered weeds, are common components. As the moisture content decreases the plant cover runs more to bluegrasses (G 95), bentgrasses (G 8), and clovers (W 190), with an admixture of weeds. In any event, a wet meadow is definitely green and the soil moist until August and often throughout the season.

### SEASON OPENING DATE

When the plant growth has advanced to where the grasses have flower heads showing and when the soil has become firm enough to support livestock without breaking the sod (except in marshy areas which remain wet throughout the season).

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Where livestock tend to concentrate, notably along stream courses and around dry edges of the meadow.



## THE WET MEADOW TYPE



### Unsatisfactory Condition

*Soil surface*—Exposed due to breaks in the sod cover, so that definite soil loss has occurred or can occur from water or wind erosion. Bumpy, especially in wet areas, due to trampling of wet soil by livestock during previous years. In extreme cases soil surface dry due to drainage and lowered water table from gully erosion.

*Herbaceous cover*—Lacking uniform density. Sedges, perennial grasses and clovers replaced by taprooted plants, as dandelions, and by temporary annual grasses and weeds.

*Shrubby cover*—Willow clumps showing well-defined grazing line, and in extreme cases bushes dead or dying.

*Dry edges and knolls*—Plant density very low, perennial grasses absent, weeds and annual grasses left. Erosion evident and extending into wet meadow.

*Watercourses*—Continuous gullies with steep banks and no protecting sod. In advanced cases banks on gentler slopes yet unsodded, and gully heads actively advancing during spring run-off.

### Overuse

*Soil surface*—Exposed and disturbed by excessive cropping of plants and severe trampling. Dry, barren areas with packed subsoil under a usually much-disturbed and fully tracked dusty surface layer. Wet barren areas and poorly sodded wet areas freshly punched and muddy.

*Surface objects*—Sticks, dung and other surface objects plainly visible.

*Herbaceous cover*—Perennial grasses mostly taken to root crown. In extreme cases coarse sedge, wire rush (GL 14), and western false-hellebore (W 201) also fully utilized. General absence of seedstalks on forage plants.

*Dry edges and knolls*—With a grubbed appearance, closely used and so trampled and disturbed that soil is shifted and plants pushed out of place.

*Watercourses*—Banks freshly broken or, if break is old, sloped and showing many tracks and trampling. If stream sluggish, water muddy or at least cloudy.



## THE WET MEADOW TYPE



### Satisfactory Condition

*Soil surface*—Covered by an unbroken sod as one looks across it. In especially satisfactory areas, sod actually unbroken except by natural watercourses and interruptions such as logs, rocks, and willows.

*Herbaceous cover*—Perennial plants, mostly sedges, grasses and clovers, and often with a sprinkling of showy-flowered weed species and rushes.

*Shrubby cover*—Willows, huckleberries and like shrubs often present. Isolated clumps of willows may show grazing line or injury, but where stands occur, bushes should not have noticeable grazing line.

*Dry edges and knolls*—Poor plant density and some erosion acceptable, provided the area affected is not spreading and is a small percentage of the meadow area.

*Small watercourses*—Pools separated by sodded areas. Banks of pools with overhanging sod, with herbage tending to mask soil of the banks.

*Streams*—With stable bottoms and sides, or at least not showing abnormal deepening of the channel or destruction of the banks.

### Allowable Use

*Soil surface*—Showing little evidence of trampling.

*Surface objects*—Dung, sticks, and cattle's hooves partially masked by remaining vegetation, especially on moist portions of the meadow.

*Perennial grasses and sedges*—Use spotty, there being islands of lightly grazed but palatable plants throughout the meadow, especially about previous years' dung heaps.

*Dry edges and knolls*—May be closely used, but should not be conspicuously trampled and dusty.

*Watercourses*—Stream bed and banks not excessively trampled or freshly broken down by livestock. Running water generally clear.



## THE BUNCHGRASS DRY MEADOW TYPE



### TYPE CHARACTER

An eastside type, common to flats and small valleys where moisture in the soil is supplied from spring run-off rather than furnished by irrigation from streams. Unlike wet meadows this type is green only in the early summer, the soil becoming dry and the plants maturing by midsummer. Ordinarily the dominant vegetation is bunchgrasses, Nevada bluegrass (G 102) being a characteristic species.

### SEASON OPENING DATE

When one-fourth of the bunchgrasses show flower heads and the soil is firm enough to withstand trampling by livestock.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Moist portions along banks of watercourses and drier edges of the type.



## THE BUNCHGRASS DRY MEADOW TYPE



### Unsatisfactory Condition

*Soil surface*—Portions exposed to wind and water erosion by inadequate cover, often with sprinkling of pebbles.

*Herbaceous cover*—Bunchgrasses lacking vigor. Isolated individual plants somewhat raised, indicating loss of surrounding soil. Annual grass such as downy chess (G 38), and tap-rooted perennials such as smooth mountain-dandelion (W 10), replacing bunchgrass.

*Shrubby cover*—Willows when present have well-defined grazing line, often entire clumps dead.

*Edges of type*—Fingers and islands of sagebrush invading the depleted meadow.

*Wet meadow areas*—Eroded, with damage extending into dry meadow.

*Watercourses*—Transformed into gullies with steep banks, or in advanced cases sloping barren banks. Gully heads advancing annually. No vegetation growing in channel bed.

### Overuse

*Soil surface*—Barren and exposed spots, notably old gully banks, trampled and dusty with numerous livestock trails crisscrossing the meadow.

*Surface objects*—Stones and dung heaps plainly visible.

*Herbaceous cover*—The better bunchgrasses cropped to the root crowns, although such low-value annual grasses as downy chess may be partially used only. A general absence of flower stalks of better forage plants.

*Shrubby cover*—Available foliage on willows taken. In extreme cases bark removed and green limbs broken.

*Wet meadow areas*—Very closely and evenly cropped.

*Watercourses*—Forage grazed out, with banks broken and severely trampled.



## THE BUNCHGRASS DRY MEADOW TYPE



### Satisfactory Condition

*Soil surface*—Because of bunchgrass dominants, soil is not completely covered. Ordinarily soil openings should not be larger than the grass bunches, although occasionally areas several feet in area are permissible if not increasing. In completely satisfactory cases there is a sod-like appearance.

*Herbaceous cover*—Perennial bunchgrasses the dominant and sometimes the sole cover.

*Shrubby cover*—Willows may have a grazing line, but should not show appreciable damage except where only a few isolated clumps occur.

*Edges of type*—Not as dense as interior but appearing stable. No evidence of sagebrush invading.

*Wet meadow areas*—May show some damage but should not be eroded unless the area is small and has no effect on other types and values.

*Watercourses*—Banks stable, not excessively eroding or being undermined. Some vegetation on bars between dry holes.

### Allowable Use

*Soil surface*—Only slightly disturbed in openings between plants, not heavily trampled or dusty.

*Surface objects*—Objects 3 inches or so high, such as dung heaps, and soil color, should be well masked by remaining vegetation when viewed from a stand-off position.

*Herbaceous cover*—Approximately one-fourth of the bunchgrasses should be unused at end of season. Use in general spotty, some areas completely taken, some lightly grazed. Even in and about closest-used areas there should be clumps of one or more plants appearing slightly used, especially around one-year dung heaps.

*Shrubby cover*—Willow foliage taken within easy reach of livestock, but bushes not mashed down or broken.

*Wet meadow areas*—May be closely used, but if damaged the area must be small and not extending into dry meadow.

*Watercourses*—Not excessively trampled and banks only occasionally broken down by livestock.



## THE SHORTHAIR SEDGE MEADOWS, FLATS AND BENCHLANDS TYPE



### TYPE CHARACTER

The shorthair or threadleaf sedges (GL 5) are short, curly-leafed, sod-forming sedges found on dry meadows, flats, and benchlands throughout the eastside and high Sierra country. Shorthair often has a meadow appearance, commonly occupying the drier land about wet and bunchgrass meadows, and gradually intergrading with them. On flats and benches, however, it usually occurs independent of any bunchgrass and wet meadow types.

### SEASON OPENING DATE

After the brown flower heads make their appearance.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Exterior edges of the type, breaks in slope or benches, knolls and water channels.



## THE SHORTHAIR SEDGE MEADOWS, FLATS AND BENCHLANDS TYPE



### Unsatisfactory Condition

*Soil surface*—Unduly exposed, and soil being lost by wind and water erosion.

*Sod surface*—Rough and broken, with sod-island edges raised above exposed soil. Occasionally black sod roots showing.

*Herbaceous cover*—Sod breaking up, clumps of sod dead; weeds becoming more evident.

*Shrubby cover*—Sagebrush invading the shorthair type edges. In advanced cases tongues and islands of sagebrush evident throughout the type.

*Shallow depressions*—Sod giving way and soil being exposed, forming pot holes.

*Water channels*—Banks breaking down and gully erosion active.

### Overuse

*Soil surface*—Barren spots dusty and tracked. Stock trails crossing meadow conspicuous from stand-off position, often deeply eroded.

*Herbaceous cover*—Closely taken, having "mown lawn" appearance so that golf balls would be plainly visible on sod areas. Some shorthair leafage left but perennial grasses fully used.

*Dry water channels*—Gully banks heavily trampled and soil shifting into channel.



## THE SHORTHAIR SEDGE MEADOWS, FLATS AND BENCHLANDS TYPE



### Satisfactory Condition

*Soil surface*—Well protected by sod, only occasional small open soil spots, some of which may be squirrel holes. Black roots of sod nowhere exposed.

*Herbaceous cover*—For the most part of shorthair sedge. On exterior borders of type, sedge often extending into openings between sagebrush.

*Shrubby cover*—Sagebrush present on borders but shorthair should appear to be invading the sagebrush rather than sagebrush invading the shorthair.

*Shallow depressions*—Should be well sodded by shorthair sedge.

*Water channels*—Banks should be well sodded and stable, not undercut by gullying.

### Allowable Use

*Soil surface*—Not trampled and dusty where sod is broken.

*Surface objects*—Objects size of golf ball partially masked by vegetation.

*Shorthair sedge*—Fairly uniform use often occurs but herbage should not be cropped closer than 1 inch of root crown.

*Bunchgrasses*—If only occasional they will be completely taken; if common there should be flower stalks on occasional plants.

*Dry water channels*—Banks may be disturbed slightly but not broken down or excessively trampled by livestock.



## THE ANNUAL GRASS AND WOODLAND GRASS TYPE



### TYPE CHARACTER

The standard is intended for that portion of the type within or adjoining the national forests. It includes the glades of the north Coast Range, the potreros of the Tehacapi and south Coast mountains, and an extensive area of woodland grass in the higher foothills bordering the Great Valley. The glades and potreros are treeless areas surrounded by forest or brushfields. The woodland-grass areas, as the name indicates, have a scattering of individuals or clumps of blue oak, interior live oak, digger pine, wedgeleaf ceanothus (B 41) and other woody species, but lie below the range of the black oak.

The forage is composed largely of annual grasses and weeds, most of which have been introduced. Wild oat (G 23), soft chess, and red brome are common grasses, and alfileria (W 74) and deervetch (W 110) are common weeds. The annual plants are affected by climatic variations, often having marked yearly fluctuations in composition and volume regardless of the degree of use.

### SEASON OPENING DATE

When the continuing growth will sustain the animals through the season or until other forage types, usually at higher elevations, are ready. Ordinarily the green annual grasses should be 2 to 3 inches high on fertile or protected spots, and 1 to 2 inches on exposed sites. The beginning of blossoming of wedgeleaf ceanothus and alfileria is also an indicator of range readiness.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Steep grazed slopes, slope depressions, and livestock trails.



## THE ANNUAL GRASS AND WOODLAND GRASS TYPE



### Unsatisfactory Condition

*Soil surface*—Over large areas mineral soil showing through the vegetation. Abnormal sheet and gully erosion evident, especially on steep grazed slopes, slope depressions, and livestock trails.

*Livestock trails*—Plainly visible at a distance—even beyond 100 yards. Trails eroded, often a system of new and abandoned livestock trails evident.

*Herbaceous cover*—There may be a high proportion of inferior species present, e.g., star thistle, turkey mullein, and red brome.

### Overuse

*Soil surface*—Practically no vegetation left to protect mineral soil and prevent erosion.

*Surface objects*—Very small objects the size of a golf ball showing plainly on the soil surface.

*Herbaceous cover*—Grass stubs grazed down to nearly 1 inch or less. Alfalfa practically trampled to dust. Most feed in partially protected places around brush piles and in rocky areas grazed out.

*Shrubby species*—Moderately palatable species show considerable use.



## THE ANNUAL GRASS AND WOODLAND GRASS TYPE



### Satisfactory Condition

*Soil surface*—Covered by a thin layer of decaying vegetation. No abnormal erosion taking place.

*Livestock trails* — Not evident except at close range.

*Herbaceous cover*—A high proportion of desirable species such as soft chess, alfalfa, and wild oat should be present on the more fertile areas.

### Allowable Use

*Soil surface*—Soil surface well covered by remaining vegetation so that mineral soil does not show from stand-off view.

*Surface objects*—Cow dung and small objects at least the size of a golf ball partly masked by vegetation.

*Herbaceous cover*—About one-fourth of current year's crop remaining. Under shrubby species where not easily accessible, practically no use.

*Weed seeds*—Where alfalfa and bur-clover (W 121) are common there should be enough seeds and burs left to be readily visible on the soil surface.

*Shrubby species*—Fairly palatable species usually show light browsing.



## THE BREWER OAK-BROWSE TYPE



### TYPE CHARACTER

This type occurs mainly in the north Coast Range in northwestern California. It is characterized by Brewer oak (B 117), the white, scaly-barked, several-stemmed scrub oak which forms distinct stands or is an important component of the browse types common to this area.

### SEASON OPENING DATE

When the Brewer oak leaves are three-fourths developed.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

The openings between shrubs, which should have some perennial herbaceous plants and a scattering of litter.



## THE BREWER OAK-BROWSE TYPE



### Unsatisfactory Condition

*Soil surface under shrubs*—Litter and duff present under low shrubs only.

*Soil surface in openings*—Lacking protection of perennial grasses, weeds and scattering of litter.

*Herbaceous cover*—Perennial plants in openings only occasional or none, but present in protected places under shrubs unless the type is severely depleted.

*Shrubby cover*—Showing grazing line and hedge-like or stubby growth from excessive browsing in former years.

### Overuse

*Soil surface under shrubs*—Sometimes disturbed under shrubs where livestock can reach herbaceous plants.

*Soil surface in openings*—Trailed and dusty.

*Herbaceous cover* — In openings, fully used and often trampled; under shrubs, cropped even though difficult to reach.

*Shrubby cover*—Oak browse generally taken, especially on low and prostrate plants.



## THE BREWER OAK-BROWSE TYPE



### Satisfactory Condition

*Soil surface under shrubs*—Well protected by a layer of litter and leafmold.

*Soil surface in openings*—Leafmold lacking; soil somewhat exposed but kept stable by presence of perennial weeds and grasses and scattering of litter.

*Herbaceous cover*—Perennial weeds and grasses distributed throughout the openings as well as in protected spots about the shrubs.

*Shrubby cover*—Oak browse showing little use; no grazing line or hedge-like growth. Low or prostrate oaks having well-leaved surface and stems masked by foliage.

### Allowable Use

*Soil surface under shrubs*—Rarely disturbed by livestock.

*Soil surface in openings*—Disturbed but not trampled or dusty.

*Surface objects*—Small twigs, leaves, etc., little broken and still retaining their identity.

*Herbaceous cover*—Most of perennial plants in openings showing some use but occasional ones appearing untouched. Herbage under and growing through shrubs rarely taken and then only topped.

*Shrubby cover*—Oak browse only occasionally taken; slight checking of height growth and no development of grazing line. It should be difficult to determine cropping without examination of the oak plants.



## THE SUBALPINE-WEED-GRASS TYPE



### TYPE CHARACTER

A type of variable composition common to the slopes between the upper limits of the red fir and timber line. The usual make-up of the type includes a variety of such weeds as woolly mules-ears (W 207), lupine (W 112), waterleaf (W 98), several species of bunchgrasses, scattered specimens or patches of sagebrush and browse, and occasional individuals and groups of conifers. Ordinarily this type is not well developed in granitic soils, usually becoming an important forage type on the lava soils only.

### SEASON OPENING DATE

When the flower heads of the bunchgrasses begin to open and the soil is dry enough to prevent muddy trailing.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Loose or steep slopes, especially where the soil is fine and unprotected by covering of gravel and stones.



## THE SUBALPINE-WEED-GRASS TYPE



### Unsatisfactory Condition

*Soil surface*—Unduly exposed so that abnormal loss of accumulated soil occurs, as indicated by small gullies and exposure of plant root crowns.

*Herbaceous cover*—Composition becoming limited; waterleaf, hawksbeard (W 57), bunchgrasses, etc., generally absent but woolly mules-ears and other low-value plants left as dominants, with woolly mules-ears often markedly increased in volume.

*Shrubby cover*—Browse species hedge-like from browsing (not climate), and dying out. Sagebrush, where present, increasing as shown by new plants.

*General aspect*—One of instability, type opening up, bunchgrasses and succulent weeds lacking vigor.

### Overuse

*Soil surface*—Disturbed, in extreme cases trailed, dusty, and markedly shifting downhill.

*Herbaceous cover*—Succulent weeds and bunchgrasses cropped so that seed production largely prevented. Woolly mules-ears leaves generally taken by sheep.

*Shrubby cover*—Blueberry elder (B 143), snowberry (B 151), and other browse species showing more than current year's growth taken.



## THE SUBALPINE-WEED-GRASS TYPE



### Satisfactory Condition

*Soil surface*—Somewhat exposed and showing some evidence of erosion on the steeper and looser soil areas.

*Herbaceous cover*—Of native perennials. Composition variable, often with patches of woolly mules-ears or lupine, or with a general intermingling of weeds and bunchgrasses.

*Shrubby cover*—Absent, or scattered with herbs, or in patches, but not increasing in numbers or area.

*General aspect*—One of stability, herbs appearing healthy and maintaining their numbers.

### Allowable Use

*Soil surface*—Somewhat disturbed by livestock but not trampled, dusty, trailed, or markedly shifted downhill.

*Herbaceous cover*—Waterleaf and other succulents closely taken by sheep if eaten while green; about one-fourth of bunchgrasses retaining one or more flower stalks. Only blossoms of woolly mules-ears taken.

*Shrubby cover*—Over half the available current year's growth of such browse as snowberry untouched.



## THE MOIST STRINGERS, SLOPES AND COVES TYPE



### TYPE CHARACTER

Although the composition varies greatly, the appearance and general range relationships are much the same for the component aspen, willow, alder and wet meadow subtypes. Furthermore, they are commonly so intermingled along drainages, springy or moist slopes and coves, and poorly drained flats that their separate identities are lost. Often aspen (B 11) with some lodgepole pine form the overstory for willows (B 141), thimbleberry (B 139), various laurels and a profusion of robust weeds such as cow-parsnip (W 91), giant knotweed, arrowleaf butterweed (W 175), western false-hellebore (skunkcabbage) (W 201), and lupine (W 112), creating a more or less dense thicket that may be irregularly broken by bits of wet meadow.

### SEASON OPENING DATE

When such weeds as western false-hellebore and arrowleaf butterweed are beginning to blossom.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

The meadow portions and their stream banks and the aspen reproduction.



## THE MOIST STRINGERS, SLOPES AND COVES TYPE



### Unsatisfactory Condition

*Soil surface*—Litter lacking; soil exposed about the aspen and between shrubs. In wet meadow, sod broken from previous years' use or rodent activity, appearing punched and irregular.

*Herbaceous cover*—No longer thick enough to mask surface objects regardless of height. Lacking desirable variety and vigor.

*Shrubby cover*—Lack of reproduction (suckers), or reproduction browsed to point of damage or killed. Small aspen have pruned appearance with dead or stunted branches; definite grazing line on taller aspen and willows that has attained a degree of permanence.

*Streams*—Banks broken and excessive erosion evident.

### Overuse

*Soil surface*—Exposed so that stones and twigs are plainly visible. Meadows trampled excessively.

*Weeds about shrubs*—Closely taken so that only coarse stems remain, even under protection of shrubs. Soil and surface objects visible from nearby view.

*Shrubby cover* — Reproduction closely grazed; most of available leafage taken. Grazing line prominent from current year's use.



## THE MOIST STRINGERS, SLOPES AND COVES TYPE



### Satisfactory Condition

*Soil surface* — Well protected by sod in wet meadows and elsewhere by litter.

*Herbaceous cover* — The wet meadow portions should, in the main, conform to the conditions described under that type. The remainder is characterized by an abundance and variety of robust weeds such as cow-parsnip, western false-hellebore, meadowrue (W 185), and many others, growing around and under the aspen and alders and often extending into the openings.

*Shrubby cover*—A variety of vigorous individuals or clumps of alders, willows, aspen (reproduction), honeysuckle (B 95), thimbleberries, laurels, etc.

*Streams*—Running water clear. Banks not eroded, in meadow portions sodded, often to the water's edge.

### Allowable Use

*Soil surface*—Somewhat disturbed but not trampled. Under shrubs and aspen, soil surface largely obscured by litter; on meadows sod not punched or freshly broken except in portions boggy throughout the season.

*Surface objects* — Objects size of golf ball partially masked on meadow types, and largely obscured elsewhere.

*Meadow cover* — Usually uniformly grazed because small in area but should not be trampled or freshly broken.

*Weeds about shrubs*—Tops and leaves taken; main stems of larger plants untouched. Plants somewhat protected by shrubs little used. After grazing, still enough weeds left to mask soil surface and bases of shrubs and aspen.

*Aspen*—As a whole, only part of available foliage taken. Except on isolated plants, stems of low, normally leaved aspen somewhat masked by its own twigs and leaves, and associated robust weeds.



## THE SAGEBRUSH, JUNIPER, AND EASTSIDE PINE TYPES



### TYPE CHARACTER

For the purpose of formulating utilization standards, the eastside Sierra ponderosa pine, Jeffrey pine-sagebrush, sagebrush-bitterbrush, and juniper-sagebrush types are combined, since they are essentially alike in character and somewhat similar in composition.

These types occur generally along the east side of the Sierras, occupying the south exposed slopes, plateaus, and dry flats. Except in the ponderosa pine type, sagebrush (B 24) is the dominant cover with bitterbrush (B 116) commonly associated with it. The shrub species are generally in open composition, permitting ready passage with horse or on foot. The common herbaceous associates are Idaho fescue (G 58), Sandberg bluegrass (G 106), needlegrass (G 114), squirreltail (G 107), dryland sedges (GL 5), hawksbeard (W 57), eriogonums (wild buckwheat) (W 70), woolly mule-ears (W 207), and lupines (W 112). These species are not found in all of the above types but two or three of them are usually present in each type.

### SEASON OPENING DATE

When bitterbrush flowers are beginning to appear, or the principal grasses such as Sandberg bluegrass and Idaho fescue are in the boot or at least 4 inches high, and the ground is firm enough to withstand trampling.

### AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION

Areas easily grazed and where livestock naturally concentrate. On cattle ranges these areas will be adjacent to meadows, low swales and forest openings, especially near routes of livestock travel; on sheep ranges it may be any open flat bench or forest opening more accessible than adjacent range, where concentration takes place through bedding or trailing.



## THE SAGEBRUSH, JUNIPER, AND EASTSIDE PINE TYPES



### Unsatisfactory Condition

*Soil surface*—Between shrubs much mineral soil exposed with sprinkling of pebbles, poorly protected by herbaceous plants and litter. Erosion often evident.

*Organic layer and litter*—Litter and decomposed organic material, except for large stems and branches, largely removed from openings.

*Herbaceous cover*—Few perennial forage grasses, and weeds in openings limited largely to the protection of shrubs and other obstacles. Herbs and grasses in openings usually lacking in vigor and often on pedestals where soil is lost. Annual grasses and weeds common, notably downy chess (G 38).

*Shrubby cover*—Bitterbrush and other browse plants "hedged back" with dead branches and often entire shrubs dead. Grazing line on juniper and mountain mahogany (B 49) and often damage to pine reproduction.

*Forage reproduction*—None evident for better forage plants; usually unpalatable plants tending to increase.

*Watercourses*—Banks raw, steep or broken down by trampling.

### Overuse

*Soil surface*—Trailed, often dusty from excessive trampling.

*Ground objects*—Objects such as pine cones, cattle droppings, small stones and branches plainly visible in openings, due to close cropping and trampling of herbaceous vegetation.

*Herbaceous cover*—Palatable forage plants in openings utilized uniformly close, seed stalks of perennial grasses few or absent. Even plants under protection of shrubs and pine reproduction closely or partially used.

*Shrubby cover*—All available current year's shoots and sometimes older twigs taken on browse species. Often unpalatable shrubs grazed appreciably.



## THE SAGEBRUSH, JUNIPER, AND EASTSIDE PINE TYPES



### Satisfactory Condition

*Soil surface*—Mineral soil not conspicuous, protected by vegetation and accumulation of litter and decaying herbaceous materials. No abnormal erosion.

*Herbaceous cover*—Healthy clumps of perennial grasses and weeds scattered in space between shrubs, partially masking the soil. Annuals generally absent.

*Shrubby cover*—Shrubs vigorous appearing stable, bitterbrush having irregular shape due to branches being left ungrazed each year. No grazing line on junipers or damage to pine reproduction.

*Reproduction*—Some reproduction of forage plants evident.

*Watercourses*—Banks stable, held mainly by perennial herbs and bunchgrasses.

### Allowable Use

*Soil surface*—Disturbed but not heavily trampled or trailed.

*Ground objects*—Remaining vegetation in open spaces somewhat screens small objects on the ground such as cones, stones, dung heaps and small branches.

*Grasses*—Approximately one-half of perennial grasses left ungrazed between shrubs, tending to mask soil. Grasses partially protected by shrubs or pine reproduction seldom taken, giving impression of spotty grazing.

*Weeds*—Herbage available on hawksbeard and nonpoisonous lupines often fully taken. Only blossoms or seed heads taken on woolly mules-ears and wild buckwheats, occasionally one left.

*Browse*—If of scattered occurrence bitterbrush may be grazed closely, but where it forms an appreciable percentage of the forage, about one-fourth of the available current year's shoots should be left untouched.



## THE MIXED CONIFER AND PONDEROSA PINE TEMPORARY TYPE



### TYPE CHARACTER

The type includes all the conifer types from the lower elevation ponderosa pine up through the mixed conifer to the red fir, but does not involve the eastside Jeffrey and ponderosa pine. At the lower elevations the type is characterized by ponderosa pine and whiteleaf manzanita (B 15). With an increase in elevation there is a gradual increase in Douglas fir, incense cedar, sugar pine, California black oak (B 123), and white fir. At the upper limits the type gives away to the pure fir stands. The dominant shrubs also change as the elevation increases. Starting with whiteleaf manzanita the sequence is deerbrush (B 44), greenleaf manzanita (B 17), and whitethorn (B 40). Herbaceous plants are not abundant, seldom providing the balance in soil maintenance they do in other forage types.

### GENERAL CONSIDERATIONS

These are commercial timber types common on the west slope and parts of the east slope of the Sierra Nevada, the north Coast Range, and the mountains of southern California. Timber production is the highest use, and therefore grazing should be adjusted to that primary objective. Furthermore, it must be recognized that in obtaining a desired stand of timber, grazing values are commonly eliminated by forest reproduction. Hence, the forage values are temporary in nature, appearing as the forest is opened up through logging or fire and disappearing as the forest canopy returns.



Another very important consideration is that the soil in these types is not ordinarily impaired by grazing. This is because the soil surface is usually well protected by needles and other litter as a result of the natural tendency of the conifers and broadleaf trees and shrubs to form dense stands. Soil disturbance caused by livestock may help in seed planting of tree species, and hence hasten the shading out of the forage plants.

The mixed conifer and ponderosa pine types are not usually problem areas with regard to the maintenance of the soil. They are problem areas in livestock management, due to the low grazing capacity, scattered feed areas, and topographic and vegetation barriers. Of the types considered, this is perhaps the least in need of standards because the soil is usually well protected and the forage is temporary in character.

#### **SEASON OPENING DATE**

When the deerbrush and whitethorn are beginning to blossom.

#### **STANDARD**

None considered necessary because any use except obvious overstocking probably would not result in damage to the soil. The condition of more important associated forage types such as meadows, browse areas, and stream bottoms should be used to judge allowable use, rather than the ponderosa pine and mixed conifer types.

## THE DEERBRUSH FOLLOWING BURN TEMPORARY TYPE



### TYPE CHARACTER

Deerbrush, often called sweet birch (B 44), is associated usually with ponderosa pine and mixed conifer stands. As the conifer stands thicken, the deerbrush and other understory vegetation die out. However, deerbrush, like many other chaparral species, produces abundant seed of long viability that germinates best after disturbances such as logging and especially fire.

Hence, a dense reproduction of deerbrush often follows after forest fires in the virgin or second-growth ponderosa pine and the lower half of the mixed conifer type. On good sites in the central portion of the deerbrush altitudinal range it commonly grows in a pure stand, which has phenomenal grazing capacity for about fifteen years. From approximately the third to tenth year the deerbrush is at its best, being largely available to livestock. Thereafter its availability rapidly decreases as the leafage grows beyond grazing height, the stand becomes dense and impenetrable, and fallen snags hinder livestock movement.

It is readily evident that the deerbrush type is of a temporary nature. If it is protected from fire, coniferous species usually recapture the site. If re-burned, the tendency is for the deerbrush to be replaced by manzanita (B 15) and for the conifers to disappear. Recurrent burns lower the site quality and eventually result in dense manzanita thickets devoid of coniferous reproduction and lacking in grazing values. Hence, even though the



capacity of deerbrush is high it does not seem possible to perpetuate it. Therefore the objective should be to return the coniferous species. Close grazing may help in this objective as it should hold the deerbrush in check and tend to release the coniferous reproduction.

#### **SEASON OPENING DATE**

When deerbrush blossoms are beginning to show.

#### **AREAS TO WATCH FOR FIRST SIGNS OF DEPLETION**

Where other types are not involved the deerbrush type serves as a guide, as explained below under allowable use. If nearby stream (stringer) types and meadows are being depleted, they should be the areas to watch.

Ordinary precautions and limitations do not have direct bearing on deerbrush-burn types because:

1. The long-time objective is to reestablish conifers rather than to maintain the browse resource.
2. Dense stands of deerbrush, fallen logs, and litter protect the soil even under heavy use.
3. Herbaceous plants are sparse, low-forage-value annuals, and are not essential to soil maintenance.
4. The browse type is temporary.

#### **ALLOWABLE USE**

First year following burn—no use.

Second year following burn—light use.

Thereafter browse heavily to check terminal growth and thus keep foliage largely available to livestock. This degree of use is allowable except where other types such as stream bottoms or meadows are being destroyed, or where steep slope and light soil, or an open stand, indicate lighter stocking is advisable.



## THE CUT-OVER TIMBERLAND TEMPORARY TYPE



### TYPE CHARACTER

Cut-over timberlands of any type are similar in that the forest canopy has been opened up or destroyed and the soil plowed and disturbed in removing the logs. Herbaceous and shrubby vegetation usually responds to this change. This tends to provide increasing forage for a few years until plant competition checks further expansion and conifer and brush again recapture the site.

For the first three years after cutting, the type should be used moderately because the soil has been disturbed and much of it left raw and exposed. Then, too, due to the temporary unstable soil condition, excessive livestock use might destroy conifer seedlings.

After three years, however, the type could be grazed up to the degree allowable in the standard for the uncut type. Since the soil then will largely be stabilized, grazing by livestock may be an aid to conifer reproduction by removing some of the competing vegetation and by better imbedding of the seed.

It is important, however, that good management be practiced, especially in handling sheep. Ordinarily open herding and one-night bed grounds will prevent damage to pine seedlings and reproduction from trampling and browsing.

### ALLOWABLE USE

Follow the standard specified for allowable use on uncut type unless other action is considered necessary because of silvicultural or soil-protection requirements. Ordinarily the same number of stock can be continued for about three years as were permitted before the type was logged, after which the rate of stocking may be adjusted to conform to forage conditions at that time.



## THE BURNED TIMBERLAND TEMPORARY TYPE



### TYPE CHARACTER

The burning of such stands as ponderosa pine, mixed conifer, red fir, or lodgepole pine produces marked changes in the site. The soil is suddenly stripped of its protecting mantle of litter and duff, is physically and chemically altered by heat and the addition of ash, and the surface is exposed directly to the climatic forces of rain and sunshine. Erosion on these areas is often severe for the first one or two years.

The returning vegetation is usually markedly different from that destroyed, the first replacements being weeds and shrubs. Many of these plants are good forage, and the grazing capacity is much higher than in the unburned conifer. However, despite the degree of stocking practiced, the forage values will decrease. If fires are kept out the shrubby plants will give way to conifer reproduction and eventually the commercial forest will return.

Ordinarily, any reasonable grazing use will not interfere with the establishment of the conifer seedlings. This statement is based on the theory that livestock disturb the soil and help imbed seed from adjacent or remaining seed trees, and through selective use of weeds and browse eliminate much competition with conifer seedlings.

### ALLOWABLE USE

First year following burn—no use.

Second year following burn—light use.

Thereafter, follow standard set up under the proper type designation.



## THE BURNED BRUSHFIELDS TEMPORARY TYPE



### TYPE CHARACTER

Some brushfields such as certain chamise areas are apparently permanent types, but most brushfields in the commercial timber zone of the national forests have replaced coniferous forests destroyed by fire. However, regardless of whether the brushfields may be considered an original or replacement cover, they normally reoccupy the site after a burn.

Brushfields do not provide a permanent supply of forage. Unburned, well-developed stands are ordinarily too dense to permit livestock movement or any appreciable volume of herbaceous vegetation. Burned brushfields usually produce varying amounts of forage such as herbaceous vegetation and succulent brush sprouts for a few years following a fire. However, the forage values decrease after two or three years regardless of the degree of grazing use, since the brush sprouts become less succulent and the herbaceous plants are crowded out. Because of the temporary character of the forage on burned brushfields, stable grazing is not possible.

### ALLOWABLE USE

The following considerations are pertinent to grazing use of burned brushfields:

1. Adequate cover to protect the soil from excessive erosion.
2. Forage requirements of deer naturally concentrating on these areas.
3. Forage utilization by permitted stock drifting from adjacent range.

Conservative use may be allowed on a temporary permit basis if surplus range is available after meeting the above requirements, making necessary reductions as forage values decrease.



## WHO SHALL USE THE RANGE?

When the national forests of the California region were established much of the area had been subject to heavy grazing use for several decades. Not only were livestock from nearby ranching units grazed but increasing numbers from distant points, following recurrent drouths on valley and foothill ranges, were being summered in the mountains. The objectives of initial Forest Service administration were to limit existing use to estimated forage capacity, and to protect and provide an opportunity for the established ranch owner and home builder. During the ensuing thirty years new permittees were selected and increases granted to established users, as surplus range capacity became available, in accordance with policies which during that period favored the small owner and sought wide distribution of national forest grazing privileges.

At present regular preferences have been established for approximately 80% of the livestock grazed on government land in the Region, which is generally stocked to capacity and fully utilized. This more or less established capacity-use condition is well known to the livestock industry of the Region and results in the demand from new applicants being limited. The considerable pressure for increases to existing permittees usually cannot be met fully because most ranges are stocked to capacity.

Study and analysis of the results of the first thirty years' administration indicated that other considerations are as vital to current national forest range use problems as were monopoly and opportunity for beginners to those of a former era. The small owner rarely developed a family-supporting scale of operation and an abnormally high rate of turnover for this class does not make for stability of units or satisfactory handling of livestock on the range. The medium or family-size permittees on the other hand showed a higher survival rate and a lower turnover than either the small scale or large scale groups. The study concluded that to best correlate use of national forest ranges with adjacent land and to provide for stability and permanence of the industry, policy should give consideration toward securing and maintaining family-supporting units of operation. The study recommends against arbitrary disturbance of going economic livestock operations with well-balanced range units, in order to provide increases to other applicants, particularly when they are not locally monopolistic in character. These recommendations have been incorporated in Forest Service grazing policy to be applied as surplus capacity is available for allotment.

The allotment of the range to carry out most nearly the aims of national forest range management, necessarily involves analysis of many factors. In many if not most cases decisions are neither automatic nor simple, where new applications, granting of preferences or increases in established preferences are involved. The progressive working out of unbalanced ranch and range set-ups already having preferential status is almost always difficult.

Rigid unvarying rules and formulae, inflexibly followed, may lead to the very maladjustments, unstable and poorly managed use and range abuse they seek to avoid.

The common types of range livestock operations have varying degrees of natural dependence on national forest ranges. Definite qualifications characterize the successful operator. The factors which can and should be weighed in passing on new applications and requests for increase of existing preferences are fully established. No unbalanced set-up is permanently hopeless. Routine precautions in acting on all applications are set by hard experience.

Guides rather than rules, and processes of analysis rather than formulae, are here used to aid the range manager in settling the practical question "Who shall use the range?"

## **DETERMINING NEED FOR RANGE AND QUALIFICATION OF APPLICANTS**

Analysis of the full set of facts which should be considered in the action on applications, involves several steps.

### **PATTERNS OF THE RANGE LIVESTOCK BUSINESS**

The broad types of natural dependency, that is, the type of range livestock operations, are the first factors in allotting grazing privileges. No two operations are exactly alike, but individual cases in very broad classes are so similar that it is the class rather than the case that rules. Minor differences rarely are significant.

#### **1. MOUNTAIN VALLEYS—HOME RANCH TYPE**

##### **Typical Home Ranch**

Generally owned by operator. Irrigated hay and natural pasture. Often moderately large operation. Pasture grazed after hay cut. Haying mid-summer. Close to national forest. Many close to Grazing Districts or Public Domain.

##### **A. Sheep Operation**

###### *Annual schedule of operation*

Feed home ranch about 100 days during the winter ; less and less toward the south. Lamb March and April on ranch or on Grazing District, leased or owned pasture ; then on national forests where lambs are finished ready to market at five to six months. After national forest season, ewes put on Grazing District or pasture.

###### *Adaptability home ranch to yearlong feeding*

Home irrigated lands being hayed in summer and unavailable. Public Domain dries during summer. Succulent feed on national forest ranges required to fatten lambs for market.

###### *Availability other feed than national forest or home ranch*

Nothing in succulent feed for fattening lambs. Home ranch hay not suitable and required for winter.



*Importance national forest range in annual schedule*

Key period, with nothing to take its place.

*Level of need for national forest range*

High.

## **B. Cattle Operation**

*Annual schedule of feeding*

Feed home ranch 120 days, December 1 to March 31. Then Grazing District, etc., spring range; then national forest range; then home ranch hay meadow aftermath or other pasture. Cows with calves and yearlings national forest range summer. Beef often fattened home ranch. Sold December-February at 2½ years or earlier.

*Adaptability home ranch to yearlong feeding*

Can use but reduces size of herd.

*Availability other feed*

Limited mostly to ranch pastures.

*Importance national forest range*

Key to full use of home ranch. Where short on such range, calf production is usually best opportunity for profits if ranch used for beef cattle yearlong or shift from range to dairy stock.

*Level of need*

High but less than sheep same area.

## **2. CENTRAL VALLEY FOOTHILL RANCH TYPE**

### **Typical Home Ranch**

Practically all range land; hay crop small and used for horses and for fattening beef; no irrigation. Feed mostly annual grasses and weeds, dries about May, sometimes earlier; close to national forests; no Grazing District near. Operation all sizes—generally larger ranches lower foothills; smaller in foothill brush, lower timber zone.

### **A. Sheep Operation**

*Annual schedule of operation*

Home ranch from date when feed greens in fall till dries out in spring, then national forest range or irrigated pastures; then lease areas with agricultural byproducts to piece out at end of national forest season; lamb on ranch February and March lower Sacramento Valley; San Joaquin lamb on ranch December and January.

*Adaptability home ranch for yearlong feeding*

Have to get lambs off when grass dries; do not fatten; dry weed and grass seeds injure or blind lambs. Ewes have to get off dry feed in summer.

*Availability other feed*

Agricultural byproducts to bridge fall gap but not in summer. Would have to lease irrigated pasture to finish lambs. Exception for ewes where lambs are marketed before feed dries and before the national forest grazing season opens.

*Importance national forest range*

Essential unless lease costly irrigated pasture, etc., early lamb crops better from ewes bred in mountain ranges.

*Level of need*

High to medium.

**B. Cattle Operation**

*Annual schedule of feeding*

No winter feeding. Home ranch pasture October to May or June. National forest summer, then home ranch. Little flexibility in moving around or on agricultural byproducts. Calve on home ranch in winter. Beef fattened home ranch in June; sold at 2-3 years. Full herd sent to national forests from Sacramento Valley foothill ranches; varies in San Joaquin.

*Adaptability home ranch*

Can get by on dry feed through summer. Stock fail to gain or lose weight from July on. Calf crop lower if kept continually on home ranch.

*Availability other feed*

Necessary but costly grain and other supplements. Irrigated summer pasture in valley usually too far distant and costly to use.

*Importance national forest range*

Builds bigger and stronger animals, even though not ready to market; fatten more quickly. Often better calf crops if on range.

*Level of need*

High.

**3. CENTRAL VALLEY UPPER FOOTHILL RANCH TYPE  
OF UPPER BRUSHY WOODLAND AND LOWER TIMBERBELT**

**Cattle Operation**

*Type of home ranch*

Little true grassland; natural timber or brushy woodland type; reverts to brush if cleared by fire or otherwise. Country rough; water poorly distributed; water development difficult and costly. Not really adapted winter or summer range. Natural units small. Little feed raised. Small operations on account of broken country and small natural units. Generally cattle.



### *Annual schedule*

Stay on home ranch, or use adjoining similar land with nonresident ownership. Move only if have national forest permit.

### *Adaptability home ranch*

Can carry cattle, but livestock poor condition. Poor range. Best for spring or fall use.

### *Availability other feed*

None only similar pasture.

### *Importance national forest range*

If this type of outfit is economic, national forest range highly important.

### *Level of need*

National forest range cannot solve basic problem of unbalanced operation and low living standard. Living standard makes necessity for subvention and aid from local government. National forest permit perpetuates hopeless attempt in typical cases.

## **4. CENTRAL VALLEY—HOME RANCH IN VALLEY TYPE**

### **Typical Home Ranch**

Produces large amounts both irrigated and non-irrigated feed crops; alfalfa, hay, grain, irrigated pasture, stubble, large operations. Remote from national forests. Both sheep and cattle stay in valley. Sheep moved up to fifty miles or more for valley feed. Lambs marketed late spring, beef early summer. Both classes use principally home ranch. Many non-owners of ranch property who lease ranches or feed as good for both sheep and cattle as on national forests.

### *Importance of national forest range*

Very low. Methods of operation do not require national forest range for balancing.

### *Level of need*

Very low.

## **5. NORTH COAST VALLEYS ADJACENT TO NATIONAL FOREST TYPE**

### **Typical Home Ranch**

Cattle small foothill valley in or adjacent to national forest. Little crops raised. Land used as range yearlong. National forest ranges natural part of home ranch units—supplement them and fit in to annual schedule.

### *Importance of national forest range*

Very high when adjoining or near home ranch.

### *Need*

Very high.

## 6. SOUTH COAST AND SOUTHERN CALIFORNIA TYPE

### Typical Home Ranch

All cattle—largely yearlong use. Few big outfits—national forest range fringe to home ranches and used incidentally. A few outfits inside boundary with national forest important part of feed. Smaller outfits have home ranches near national forest boundaries use small amounts of fringes on an on-and-off basis.

#### *Importance of national forest range*

Low. Private land providing automatic selection of permittee.

#### *Level of need*

Low but with exceptions where operations fall in other patterns.

## 7. DIVERSIFIED FARM—MOUNTAIN VALLEY TYPE

### Typical Home Ranch

Irrigated feed or natural meadows, handled for grain or hay which is sold. Raise fruit and poultry. Amount of livestock gauged to utilize agricultural byproducts. Ranch operation fairly flexible. Can adjust from range to dairy cattle.

#### *Importance of national forest range*

Desirable to round out for range livestock; not needed for dairy stock.

#### *Level of need*

Only moderate.

## RELATIONSHIP BETWEEN PROXIMITY AND NEED

Ideas of the relationship between ranch property and national forest ranges were developed in the days of slow and primitive means of transportation under which livestock went to and from the ranges under its own power. With the development of more modern but economic methods of moving livestock, particularly shipment by truck, the picture changed and there is a much greater flexibility in the use of ranges than was possible formerly. Mere proximity has lost much of its earlier significance.

However, there is a group of small users who live close to the forest ranges in whose economic life the nearness of this range is the determining factor as to the kind of operation they are able to develop. Thus, a diversified rancher living near the forest boundary can run half a dozen head of cattle in a gulch near his home to which he can give proper care and on which he can secure a high return. Possibly, several small, similarly located owners can handle their livestock under a community plan of management. Their requirements for supplemental income, the suitability of their ranch properties for the type of operation, and the need of utilizing agricultural byproducts automatically qualifies them for national forest permits. This type of operator living at a distance from the forest cannot well afford the cost of transporting his livestock very far, in view of the small size of his herd. Furthermore, as distance from the range increases,



greater managerial skill is required for a successful operation of both ranch and range. Without this quality the livestock operation, which is precarious at best, becomes a losing venture and a point is reached where it is of economic advantage to operate the ranch property as a self-contained unit.

For this reason such factors as managerial skill, size and credit become more essential qualifications as distance from the range increases.

While the Forest Service has a very definite obligation to contribute to the support of local communities, this should not be carried to the point of giving priority to uneconomic operations merely because they are nearby and if more distant users show a greater need for the range as part of successful business enterprises.

### **WHERE DEMAND FROM A COMMUNITY EXCEEDS SUPPLY OF RANGE**

The degree to which livestock are essential in farm operations varies enormously in different communities and on different farms. In some, where the crop lands produce principally hay and grain, by far the most efficient way to harvest the crops is to convert them into meat, wool and milk products, that is, with livestock. In others, where fruits and truck crops are produced and can be harvested directly, livestock can utilize the agricultural byproducts and are thus a desirable supplementary, but not primary, feature of farm operations. In most farm communities, some livestock is advantageous and in some cases an essential part of the picture.

In any case, the cropland products are available only seasonally, leaving part of the year in which the alternatives may be, for example, purchase of expensive supplements or use of mountain range.

Since, commonly, the farms in a given community fall in the same general pattern, it often happens that all or nearly all the operators in a community have about equal need for mountain range—a need which frequently exceeds the available supply. Of course, if the supply of national forest range is adequate to meet the demand, no great problem exists. But with deficient supply it is necessary either to allot:

1. To all applicants possessing equal qualifications of dependency and commensurability. This means that all or most operations will be well below economic size, considering livestock alone. It means that diversification will be necessary for individual operations to be economic, that is, capable of supporting a family on a satisfactory standard. This solution is acceptable where diversification exists.

2. To the best qualified applicants, everything considered, to the number for which permits of economic size can be granted. The latter alternative is preferable where diversification does not generally exist or where a portion of the farms are best adapted to livestock production, and where pro-ration of grazing privileges to all applicants would put them all below economic size.

In areas where a great demand exists and individual farms vary in de-

pendency or in adaptability to diversification, it is necessary to establish a series of local priorities, expressing the relative need and qualification of each similar group of farms.

## **INDIVIDUAL COMMENSURABILITY**

Priority is given permittees owning a substantial part of the ranch property necessary to care for their livestock while they are off the national forest. The remaining lands should be held in a firm type of control appropriate to the locality. This may mean a license on a Grazing District, a term lease on pasture lands and the like. Where it is the practice to rent stubble and cropland aftermath, term leases may be waived.

Where winter feeding is practiced, the ownership of hay-producing lands in sufficient quantity to feed the stock in accordance with the best local practice is necessary. Likewise where livestock are wintered on annual grass pastures, all of such lands required for wintering the stock at a level of operating efficiency will be required.

In order for a permittee to be commensurate, it is expected that lands used while off the national forest will be conservatively managed. Development of permanent, stable, livestock operations can be attained only by conservative management of both public and private lands.

To check on the commensurability of ranch property, the ownership will be determined from the county records. Hay production will be determined by estimating the contents of barns and haystacks. (See appendix.)

## **QUALIFICATIONS OF SUCCESSFUL RANGE LIVESTOCK OPERATORS**

Long experience in dealing with range operations makes it possible to set down the qualifications of successful range operators. These include the following which may be used as a guide, when opportunities arise, in the granting of grazing privileges.

### **1. The Concept of Land Husbandry**

The intent of permanency and of safe and enduring use, not only of ranch but of range, rather than of quick mining and lasting injury to soil and crops. Actual practice to carry out intent.

### **2. Managerial Skill**

Personal attention to land and livestock, applying proved practices to manage animals on ranch and range, keeping up and adding to improvements which will improve management, business promptness in foreseeing needs and in adapting his operations.

### **3. Economic Size of Operation**

If not already of a size to maintain a home with a decent standard of living, tendency to increase in size.

### **4. Ownership or Control of Feed**

Carries reserve to avoid the chance that he will be forced to abuse or sell livestock, or pay exorbitant prices for feed during emergencies.



## 5. Credit Facilities

Credit rating and business standing to finance seasonal needs, and prudent expansion of needed improvements.

## **ACTION ON NEW APPLICATIONS AND APPLICATIONS FOR INCREASES**

Several major considerations have to be kept in mind in acting on applications. Systematic checking of these is important. A particularly difficult process is involved where seeking to cure unbalanced set-ups.

## **FACTORS TO CONSIDER AND RATE IN CONNECTION WITH INCREASES OR APPROVING NEW APPLICATIONS**

<b>Before Granting Increases in Existing Permits</b>	<b>Before Granting Permits to New Applicants</b>
1. Real need for national forest range. Type of operation rather than distance from national forest.	1. Same.
2. Commensurability of ranch property. Other feed under firm control.	2. Same.
3. Conditions of management of ranch property. Safely stocked and stable rather than on exploitation basis. Needed improvements made and maintained.	3. Same.
4. Managerial skill displayed on range. Personal attention to livestock, following range management plan.	4. Past experience in range livestock business.
5. Record of range operation. Tendency to build up in size if below economic limit.	5. Financial ability and desire to build up and operate an economic sized outfit.
6. Financial and business ability and intent to handle an economic sized outfit. Business standing.	
7. Willingness and ability to improve range. Intent to have high-grade operation.	

Rating of "high" or "medium" should be secured on all items to be eligible for favorable action. Where inferior ratings are given on items 2, 3, 4 and 5 on existing operations, prompt and positive steps should be taken by the applicant to improve conditions, before consideration can be given him. Such an analysis is of great value in reaching a decision between two or more well-qualified applicants. The analysis cannot well be applied with outfits in which livestock raising is an incidental part of an entire set-up. Neither can it be applied literally in cases where the Forest Service is not a free agent because of private-land complications.

## HANDLING UNBALANCED SET-UPS

The theories on which national forest range preferences have been granted have worked out only in part. Today there are many individual preference holders, and typical classes of holders, whose operations are recognized as inherently unbalanced or uneconomic. A socially desirable set-up is one on a decent standard of living with opportunities for schooling, churches, and the other social facilities necessary for the full enjoyment of life. Conversely the occupation of marginal lands or of units marginal in size, is socially undesirable. Often only a part of the income is gained from the farm and the remainder must come from subsidies in the form of relief or, as an extreme example, the county paying the operator to maintain the road to his own place and hiring his wife to teach their own children. Fostering such set-ups tends to make permanent "hill-billyism," increases school, road, and other governmental costs.

Because of past commitments these situations can seldom be worked out forthwith. But they can be readily identified and solutions worked toward over a period of years.

### PROBLEMS IN CONNECTION WITH ACTION ON APPLICATIONS

#### Problem 1:

Home ranches have been accepted as commensurate ranch property, and preferences granted, when ranch located in the upper brushy foothill-lower timberbelt on the east side of the Sacramento Valley and in the brushy foothills of the north Coast Range.

#### *Conditions*

The home ranches are of very low quality land of small grazing capacity. Turnover in permits on the area is rapid. There is a demand from the owners of higher quality land. A searching study and analysis of the situation by state, university, and departmental authorities has shown conclusively that this class of property is not suited for the present use, but rather for spring or fall range. This means the areas should not be accepted as commensurate.

#### *Action*

Continue present preferences, but

- (a) refuse to recognize new applicants, and
- (b) as preference holders drop out, distribute range thus made available to fully qualified applicants.

#### *Why*

It is false economy to permit conditions such as this to continue any longer. They should be cleared up just as soon as feasible with fair regard to equities of the permittees.

#### Problem 2:

Available national forest range held in small preferences, all far below economic size.



### *Conditions*

A group of stock owners with commensurate ranch property has established preferences for numbers of cattle averaging between 40 and 60 head. Most of the owners are not well qualified to handle such undertakings, but have managed to cling on with a very low standard of living. This is indicated by the necessity for aid from local government, which commonly takes the form of paying the man to work on the road. The handling of livestock on the range has consisted largely of turning the cattle onto the national forest in the spring, an occasional visit in the summer and removal in fall. This action is all that can be expected as the men of the household have to try to supplement their means by other employment.

They cannot afford to hire riders. A thorough analysis of the economic situation of outfits of this kind shows that it is not economically feasible to handle a cattle-raising outfit and make a fair living for an average-sized family with less than 150 head of cattle. Range inspections show that due to the lack of management the range is being very unevenly utilized and some is deteriorating. The set-up has persisted for years.

### *Action*

The ranger gets the permittees together with the supervisor and outlines the situation. He lays down certain essential practices that must be followed in range management in the interest of range protection. They are told forcefully but diplomatically that all of these things must be done in the ensuing grazing years or it will be necessary to recommend such reductions in grazing preferences as may be necessary to offset damages caused by lack of management. The permittees argue a lot but finally agree that none of the requirements are either unreasonable or more expensive than is necessary for the satisfactory management of livestock on the range. Some of them decide to go out of the range livestock business as they were hardly breaking even. This slack allowed the granting of needed increases to the others.

### *Why*

It is preferable to have a few well-managed outfits of a size that will return a fair living to an average family than to have several small, uneconomic sized permittees struggling along on a starvation basis and eking out a miserable existence at the expense of the range.

### **Problem 3:**

Use of home ranch, recognized as commensurate ranch property, for purposes other than in direct connection with the handling of his range operation.

### *Conditions*

A sheep permittee with an established preference owns a fine large commensurate home ranch, which he has used in the winter for sheep. Through changes in status of other range outfits and the purchase of

a few water holes he finds it possible to secure winter range for his sheep in the desert. He uses the home ranch to raise hay for sale rather than for his own use.

#### *Action*

A study should be made to determine whether the winter range he is now using with his own water supply can be accepted as commensurate ranch property. The question as to whether he really is dependent on the national forest for summer range also should be determined. Appropriate action either to accept the newly acquired land as commensurate, or to require the permittee to use his home ranch as was agreed upon his grazing application, or to recommend revocation of his preference.

#### *Why*

The use of the home ranch was the basis for the preference. The use must be continued or formal modification obtained to substitute other property, or the permit is subject to cancellation.

#### *Supplemental*

A similar situation might arise in which the home ranch property was not diverted from its original contemplated use but was merely not used at all in connection with the range livestock operation. Determination, then, of the inter-relation between the ranch and range use and the actual need for national forest to round out the ranch would be required.

#### **Problem 4:**

Should the national forest meet the range needs of the small ranchers who live near the forests but who are not in the business of livestock raising as a major activity, but do want to run a number of livestock well below the economic limit on the range?

#### *Conditions*

Adjacent to most national forests are many small ranches which are fully commensurate with a small number of livestock but on which the owners are engaged in many activities other than livestock raising to earn a living. However, in order to utilize the products of their ranches to the full and to give the owners as diversified and productive an operation as possible, these men frequently need to run small bunches of range livestock. The only place where this is possible is on the adjacent national forest. There often is a canyon or two back of such places, if they lie along the forest boundary, which can best be utilized by the livestock of these owners. The major difficulties with such outfits are that the owners usually are indifferent stockmen, hence are careless as to the quality of livestock they run, and are inclined to overlook the need of bulls, salting, etc. It will take extra supervision to get the permittees to follow good range management practices and to appreciate that while only part of their livelihood comes from the range livestock, the management of this must be to a high standard.



### *Action*

If such ranchers apply for permits and room can be made for them under the Regulations they should be given them. Adequate handling of the livestock will be required. Fenced units should be provided if possible.

### **Problem 5:**

A new applicant seeks to secure a permit for 100 head of cattle on a range allotment already stocked to its estimated grazing capacity with the livestock of four permittees with recognized preferences of 200 head each.

### *Conditions*

The upper limit for the range involved is 300 head of cattle. The applicant, after several years of residence decides he wants to get a national forest permit as several of his neighbors have such privileges. He is a nearby resident of the national forest. His ranch property is fully commensurate for the number of livestock for which he has applied for a permit. He has been running a bunch of about 80 head of cattle on leased range in the foothills. He has been having a tough time to make both ends meet, has rather low-grade ranch buildings, and six children of school age.

### *Action*

The supervisor disapproved the application and notified the prospective permittee to that effect.

### *Why*

A reduction of established preferences below the upper limit for the purpose of distribution is not permitted. It is far better to have four permittees with a size of outfit at the economic limit of around 200 head with which they can make a fair living than to distribute the privileges and have four unbalanced set-ups, struggling to get along with 175 head each and one at 100. The national forest forage producing area is not sufficient to provide range for all qualified users who may want to run livestock upon it.

### **POINTS DEVELOPED BY PROBLEMS**

1. Unbalanced set-ups result either in unsatisfactory management of livestock on ranges or in economic conditions and low standards of living that are not in the public interest. Problems 1 and 2.
2. Home ranches that are not suitable for livestock raising should not be accepted as commensurate ranch property in connection with the granting or continuance of grazing permits. Problem 1.
3. Prompt and corrective action with due regard for the interests of the national forest range and, second, to the interests of the individuals, should be taken in connection with grazing permits wherever clearly established facts show this to be needed. Problems 1, 2 and 3.
4. Commensurability of ranch property accepted as such in connection with grazing permits, must continue during the life of all grazing

preferences. Where the relationships change permit conditions should reflect this. Problems 1 and 3.

5. Continued definite need and dependence of permittee on national forest ranges must exist on the part of all permittees or established preferences cannot continue to be recognized. Problems 2 and 3.
6. Grazing applications and permits are contracts, all of the terms of which must be lived up to or they are subject to revocation. Problems 2 and 3.
7. The national forest ranges can serve a useful purpose in providing for small bunches of livestock that are run by local ranchers who have commensurate ranch property and are dependent on the forest for range but who have diversified interests which make up an economic outfit and all are considered. Problem 4.
8. Every effort should be made to correct unbalanced set-ups by agreement with permittees, or by taking advantage of turnover, before taking arbitrary action. Problems 1 and 2.

### **ROUTINE HANDLING GRAZING APPLICATIONS**

1. Permittees are advised individually of planned reductions in numbers or seasons after the close of the grazing season.
2. Application blanks mailed permittees generally in January with notice of rates to be charged and the closing date for receipt of applications.
3. Soon after the closing date, ranger and supervisor (or staff) approve applications showing numbers, seasons, allotment assigned and prepare special stipulations to be included in permit.
4. Form 874-12 or substitute is filled out for or by ranger.
5. Clerical force computes fees, prepares L/T and mails to permittee.
6. Livestock are not allowed on range until fees are paid or, if payment is split, until first payment is made.
7. In case livestock get on range before fee is paid, permittee is advised and trespass action can be taken if appropriate.
8. Second payment is more apt to be delinquent and if permittee does not respond to second notice ranger may advise him personally. Trespass action may likewise be taken if appropriate.

### **ROUTINE PRECAUTIONS IN ACTING ON APPLICATIONS**

1. On allotments with competing demands be sure you have the whole picture before acting.
2. If there are no highly qualified applicants accept lower grades successively.
3. Check on payment of back fees and assessments.
4. Use full probationary period on temporaries before granting preferences.



5. If an unbalanced set-up, either of individual or group, check for chance for remedial action.
6. Check for opportunity to build up qualified applicants toward economic size and watch against building above it.
7. Check findings of previous years inspection for adjustments needed for range protection on account of change in grazing capacity estimates, closures or restrictions in use—"reductions for protection."
8. Check on previous year's records for material noncompliance and decide action needed for protection of the range.
9. Check suitability of established opening and closing dates—"seasons."
10. Check on use of home ranch property as provided in grazing contract.
11. Check on compliance with State laws, county ordinances, association special rules.
12. Check on livestock and ranch property ownership.
13. Check on leases or ownership of range lands inside national forest.
14. An as-of-today reappraisal of (a) suitability of home ranch for the livestock operation, (b) the real grazing capacity, and (c) degree of improvement or deterioration of home ranch—"commensurability."
15. If for increase of established preference whether applicant and his operation qualify in all respects—"increases."
16. If new applicant or temporary up for renewal, whether all desirable qualifications indicate a successful operation—"preferences."

# MANAGING THE RANGE

Several distinct groups of decisions affect and control the management of ranges. What units or parts of units are unusable or need to be closed, whether cattle or sheep shall be permitted, setting of opening and closing dates, setting unit boundaries, appraising grazing capacity, changing the kind of livestock, all involve appraisals of current facts and conditions. Underlying these decisions are the range inspections, serving both as a necessary procedure to gather facts, and as an indispensable process for getting the operator to understand and apply the effective range practices provided in the management plan.

## WHAT AREAS TO GRAZE OR NOT TO GRAZE

Some areas, because of physical conditions, are not usable for grazing. Others, because of inescapable conflicts with other forms of forest use, have to be closed to grazing. Limited areas, where further deterioration of soil and forage is curable by no other means, must be closed. There are, too, broad classes of ranges on which grazing use competes with other forest values and uses, but where both can generally be permitted.

### CLOSED TO ALL LIVESTOCK TO REBUILD SOIL

Where there is a job of soil rebuilding as the result of any type of accelerated erosion, closure to grazing is desirable. Here vegetation must be given every opportunity to bind the remaining soil and start the process of again producing a mantle of topsoil. Where erosion control structures are installed, fencing against unherded stock is needed so that vegetation can make them fully effective.

Where the important and desirable forage species are so thinned by overgrazing that the most moderate grazing prevents their reproduction or recovery, closure is indicated.

### BRUSHFIELD BURNS

Heavy burns on steep slopes with unstable soil, where use would accelerate soil movement, should be closed for a few years.

## REPRODUCING TIMBER ON CUT-OVER LANDS AND PLANTATIONS

Because of the value involved in plantations and the necessity that reproduction be given every opportunity to become established on cut-over lands, these areas are ordinarily withdrawn at least from sheep grazing until enough seedlings are established and have passed through their first year. Thereafter full utilization may be allowed.

### MAIN HIGHWAYS AND SCENIC STRIPS

High-speed highways are obviously unsuited for livestock driveways, or for livestock to drift onto or to cross. As a necessary safety measure, both to travelers and to livestock, such highways should usually be closed or fenced against unherded livestock. Moreover the inevitable abuse of the



roadside too often leads the public to believe it representative of the condition of adjoining national forest range.

### **RECREATIONAL USE**

Withdrawals should be made as follows :

- a. Tourist pastures and reserved areas for the actual need of the pack and saddle stock of the traveling public.
- b. Closures of centers of intensive recreational use. The conflict of groups of summer home permittees, camp ground users, and the like, with livestock, precludes grazing use. This closure involves the area occupied and a buffer zone either to a natural boundary or to an artificial one circumscribing the hiking territory.

### **DENSE TIMBER**

In addition to extensive areas of fir and Douglas fir too dense to produce forage there are areas where forage is too sparse for economical use. Timbered and brush ranges requiring an average of fifteen acres or more per cow per month over a whole unit can seldom be economically used. This condition is often found in the mixed conifer type in the Sierras from the Merced River north to the vicinity of Mt. Lassen. Such areas are not adapted to sheep.

### **CLOSED TO ONE KIND OF LIVESTOCK**

#### **ROUGH STEEP SLOPES**

There are many areas in canyons and in the higher mountains that are too steep and rocky for use by cattle. For sheep, however, there seems to be no area worth getting that is too rough for them to get over. Only small isolated feed areas on ledges and in pockets need be eliminated from consideration from the standpoint of roughness.

#### **LACK OF WATER**

The complete lack of water may exclude areas from use. If the areas are of value the hauling of water is usually feasible and will permit their use by sheep.

### **POISONOUS PLANTS**

The presence of considerable amounts of the following species of poisonous plants on sheep or cattle ranges may prevent their economic use.

Sheep :

Deathcamas  
Laurels  
Milkweed  
Lupine

Cattle :

Waterhemlock  
Larkspur

Losses are too often the result of failure to use the best possible management practices. In all cases consideration should be given to the feasibility of eradication, better management, deferred use or a change in kind of livestock to solve the problem.

## AREAS GENERALLY TO BE USED

### INACCESSIBILITY

There are no *good* ranges so far from ranches or markets as to preclude their use. The nonuse of inaccessible areas is because of low quality of forage or other detrimental factors.

### REPRODUCTION ESTABLISHED

When plantations pass the stage of getting young trees established grazing use can ordinarily be allowed.

### SCATTERED OR DIFFUSED RECREATIONAL USE

Except where really concentrated recreational use exists, range livestock can usually be permitted without critical conflict.

### DEER

Normally there is a lack of balance between the summer and winter ranges used by game. In the southern forests there is found an insufficient area of the desirable summer range. Where there are large numbers of deer this results in the overuse of the browse. Conversely in the northern forests, this condition occurs on the winter ranges. Where there is any approach to the optimum numbers of deer, additional reservation of forage is needed for the critical season. This may necessitate total closure of these big game areas to domestic livestock.

## PROBLEMS IN COORDINATING GRAZING WITH OTHER USES

### Problem 1:

What areas can be grazed around intensively developed recreational centers?

#### *Conditions*

Certain limited designated areas of national forest land have been dedicated to recreation as its highest use. Many summer homes have been built therein. Camp grounds have been developed to accommodate large numbers of people. They are intensively used by vacationists. The areas lie within units that have rather high forage values.

#### *Action*

A large enough area should be closed against the grazing of livestock to prevent invasion of the intensively developed portion of the recreational area as well as to provide reasonably for the hiking use of adjacent territory.

#### *Why*

In order that the multiple use possibilities of the national forest can be realized by wise planning and use. Conflicting interests can be served if these are integrated with each other and through segregation are not permitted to interfere with the use of the area which has been assigned to the other use.



## Problem 2:

Steps to solve problem of range, used and needed by domestic stock, that is heavily overstocked with deer.

### *Conditions*

Large range in northeastern California; summer range fully stocked, and winter range 100% overstocked by deer. Stocking of entire range by domestic animals is conservative; both sheep and cattle have been reduced 30% to provide deer feed. Dependency of permittees is high; the range is essential and irreplaceable to round out ranch set-ups. Further reduction or elimination of livestock would result in further increase of deer herd; no permanent solution of the problem would be effected. The range is being depleted of browse by the deer.

### *Action*

Get all the facts. Prepare and submit plan to reduce deer herd to grazing capacity of range that can be allotted to deer; 50% reduction indicated. Anticipate following arguments against necessary killing of does:

1. That the range damage is not as serious as stated.
2. That the livestock are responsible, particularly sheep.
3. That opening the refuges might solve the problem.
4. That the deer might be herded to another winter range.
5. That fencing should be done.
6. That it is unsportsmanlike to kill does.
7. That letting down the bars on does will destroy conservation principles they worked so long to inculcate.
8. That it will give the doe killers a new lease on life.
9. That it is illegal.
10. That we should trap the deer and restock other areas.

### *The answers may include:*

1. The range manager must be the judge of damage.
2. Adjustment of livestock numbers will have but minor effect on the problem. It would create a temporary vacuum that the expanding deer herd would soon fill up and only postpone meeting the issue.
3. Opening of refuges would result in the taking of a few more bucks, would further unbalance the sex ratio, would not reduce the breeding potential of the herd.
4. Herding and fencing are never feasible and if they were would only be temporizing.
5. Utilization of surplus game need not be unsportsmanlike.
6. If taking surplus does is "letting down the bars" there is no hope for managing deer herds.
7. Law enforcement is always a problem. It is only as good as the people want. It is the people, not the wardens, that are the major factor in game law observance.
8. Legal obstacles can be overcome.

9. Transplanting deer to understocked areas is useless because every potential deer range in the State has a nucleus of a herd. If given a chance it will expand. Transplanted stock would be subjected to the same factors of environment, poaching and predatory animals, that prevent the increase of existing herds. The chances for their increasing would not be improved.

#### *Action*

The supervisor created interest among all agencies, obtained cooperation of the State Division of Fish and Game, provided show-me trips and other methods to acquaint the public with the problem. A proposal was made to interested groups to have an antlerless deer season with the alternative of either (1) action under State laws or (2) under Federal authority to remove animals destroying Government resources. The supervisor initiated action toward the development of the final plan for the removal of excess numbers of deer.

#### *Subsequent action*

- (1) Reduce deer herd to grazing capacity of winter range with numbers coordinate with the fully dependent livestock industry.
- (2) While adjustment is being provided encourage nonuse on a temporary basis to start forage on upgrade.

#### **Problem 3:**

Where range is to be used, how can excessive competition between hunters and livestock at springs on poorly watered ranges be reduced?

#### *Conditions*

An area of mixed private and Government land with few watering places has a deer season starting September 16, and a grazing season closing date of September 30. Occupation of all water holes by hunter camps forces livestock off the range or causes them to lose weight by staying away from water too long.

#### *Action*

- (1) In cooperation with stockmen designate certain watered camping places for hunters.
- (2) Post areas closed on Government land while stockmen should post private lands under their control against trespass.
- (3) Stockmen and Forest Service should provide adequate patrol to insure compliance with the plan.

#### *Why*

By agreement of a workable plan conflicting interests can use the same areas if each will respect the rights and needs of the other.

#### **Problem 4:**

Whether or not to use a lightly stocked national forest range unit, which after repeated reductions does not respond to the effort to bring it back to a satisfactory condition.



### *Conditions*

A range with watershed values on which livestock grazed in large numbers prior to its inclusion in the national forest was found to be in serious condition after a careful range survey. Conservative grazing capacity figures were set up and the numbers of permitted livestock were cut repeatedly until they were materially below the figures the range was supposed to be able to support. There was no opportunity to change the kind of livestock because of shortage of water and type of available feed. The range did not improve but continued to deteriorate.

### *Action required*

Area was closed to the grazing of all livestock.

### *Why*

The treatment being tried was not giving satisfactory results. The decision was that the total exclusion of livestock was necessary to bring the range back to a satisfactory condition.

### **POINTS DEVELOPED BY PROBLEMS**

1. Where conflicts develop with highly improved intensively used recreational units, sufficient area should be closed to livestock use to prevent their invasion. Problem 1.
2. In cases where the seasonal range is out of balance because of excess stocking by deer, or where there is a larger deer population on a range than good management can care for, steps should be taken to eliminate the excess, and adjustments should be made by reducing the total stocking to what the range unit will support. Problems 2 and 3.
3. "Give and take" is necessary if broadest use of ranges is to be followed where there are conflicting needs for limited facilities. Problem 3.
4. If lighter stocking of overgrazed ranges does not bring them back, then resort to closure. Problem 4.

### **CATTLE OR SHEEP?**

Some ranges have been used on the basis of the habits and preferences of applicants without a thorough analysis of the kind of livestock to which they were best suited. The conditions off the national forest at times make it desirable to use seasonal ranges for a kind of livestock that graze them less efficiently. However, most ranges are better adapted to one kind of livestock than the other. Each kind of livestock has a distinctive group of preferences. Some ranges are about equally suited to either, but that does not mean that both should usually be permitted on a range.

### **THE DUAL USE FALLACY**

Due to the different preferences of cattle and sheep there is a wider range of palatable plants when an allotment is used by both kinds of livestock. It has been assumed therefore that a higher grazing capacity could

be secured thereby. The fallacy of the dual or common use idea is indicated in Figure 13.

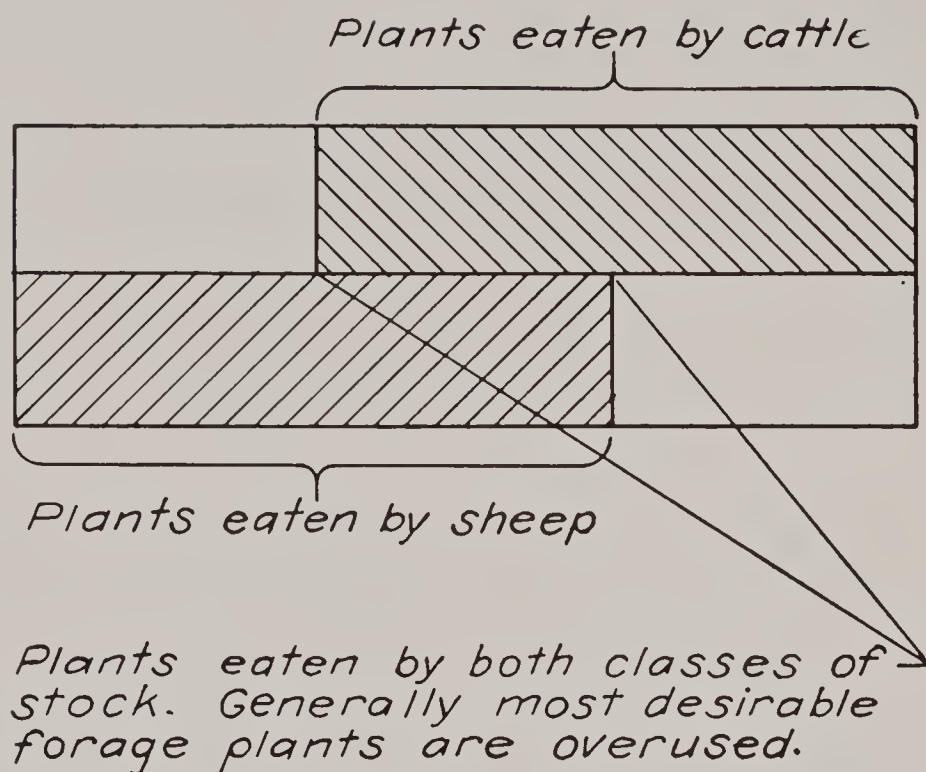


Figure 13.—DIAGRAM SHOWING THE FALLACY OF DUAL USE

It will be seen readily that the group of plants relished by both kinds of livestock will get excessive use.

#### CONDITIONS UNDER WHICH DUAL USE MAY BE ALLOWED

1. Where drift of cattle onto a sheep range cannot feasibly be prevented. Reduce the rate of stocking proportionally.
2. On sheep allotments having wet meadows with coarser sedges and rushes, cattle grazing may be allowed in a number not to exceed the grazing capacity of the meadows with an equivalent adjustment in rate of stocking for sheep.

#### PREFERENCES AND REQUIREMENTS OF LIVESTOCK

##### FEED

##### Cattle

Cattle prefer grasses to weeds. Predominance of grasses over weeds is strong evidence in favor of use by cattle. Meadow feed is more suitable for cattle than for sheep.

##### Sheep

Sheep prefer succulent weeds and browse to the grasses. Predominance of weeds and browse over grasses is strong evidence in favor of use by sheep. Because of more trampling than feeding by sheep on meadows, these areas are not best adapted to their use.



## COVER

### Cattle

Open, with only sufficient cover to afford shade for resting grounds is best. Cattle can however use range with dense stands of brush and timber unfitted for sheep grazing.

### Sheep

No excessive windfalls, and no extensive dense thickets, because the herder loses control of the herd with possibility of loss of individual sheep or small bunches.

Patches of cover distributed over the range are desirable to furnish shade for the daily resting period and to afford shade to plants that would otherwise lose their succulence.

## POISONOUS PLANTS

Waterhemlock: Affects both cattle and sheep but sheep seldom poisoned as hemlock grows in moist areas little grazed by sheep.

Tall larkspur.

Low larkspur (east side of Sierra).

Laurel.

Lupine.

Milkweed.

Poisonous plants are rarely sufficiently prevalent on cattle or sheep ranges to prevent use. In some localities better to fence or eradicate than to change kind of livestock.

## WATER

Cattle drink daily. Should not travel more than one-half mile in rough, steep country nor more than one mile in open rolling country or two and one-half miles on the level.

Seeps and small springs inadequate to water a band of sheep are invaluable on cattle ranges and generally worth developing. Supply should be judged during dryest season.

Sheep will not need water for four days or more when feed is green and will go for weeks without drinking when dew and showers occur and plants are succulent.

Can be grazed from one watering place to another without suffering or damage to range when places not more than four miles apart.

Watering places should provide 2000 gallons daily and have space for an average band of 1200 head to water at one time.

## SOIL

Cattle do not damage loose soil to the extent done by sheep. There is less trampling and cutting of ground cover except under too early use, or through concentration on meadows. Overuse of trails may cause gullies and breakdown of stream banks.

On easily eroded slopes sheep do extensive damage because of the habit of following in tracks of leaders resulting in numerous trail and soil creep.

## TOPOGRAPHY

### Cattle

Cattle are grazed to best advantage on rolling or level country. Limited use can be secured from rough, steeper, rocky areas.

### Sheep

Sheep can use rougher and steeper country than cattle. The limiting factor is the ability of the herder to handle his sheep.

## ELEVATION

No factor.

Cool temperature, succulent feed necessary to good condition, ordinarily found above commercial timber and above the 6000-foot level.

## CONFLICTS

Hunting.

Planting and cut-over areas.

Use of range by wildlife.

Recreational use.

Recreational use.

Wildlife.

Watershed under some conditions.

Watershed under some conditions.

## PREFERENCES AND REQUIREMENTS OF THE INDUSTRY

### Cattle

Beef and dry stuff: The forage for this type of cattle should be nutritious growth. Dryer ranges are desirable.

Cows with calves: A combination of dry and succulent feeds, the latter available well into the summer season is best.

### Sheep

A good range is one which will result in a fast-growing and fat lamb. Succulent forage for milk production is desirable. Ranges having forage maturing successively through summer by types or elevational zones are ideal. For bucking, open rolling areas of higher grazing capacity are needed.

## PROBLEMS IN DETERMINING KIND OF LIVESTOCK TO BE GRAZED

### Problem 1:

#### *Conditions*

*Range:* In northeastern California. *Feed:* Bunchgrasses, sunflower, lupine, waterleaf, aspen and snowberry.

*Cover:* Aspen stringers and fir pockets with some extensive open fir areas; 50% of the area open sagebrush, browse and weed; many large springs and small streams in the gulches but 1000 acres on high, sagebrush-bunchgrass ridge at least one and one-half miles from water.

*Soil:* Largely firm, gravelly loam over 75% of the area. Remainder rocky.

*Topography:* Rolling to moderate with 25% of area on steep rocky slopes.

*Elevation:* From six to eight thousand feet.

*Conflicts:* No recreational use. A moderately heavy deer population hunted quite extensively from September 16 to October 15.



## Summary

*Feed:* Predominantly suitable for sheep.

*Cover:* Adapted to either kind of livestock.

*Water:* 80% of area is suitable for use by either kind. High ridges (20% of area) which is usable only by sheep.

*Soil:* Topography generally adapted to either, but rocky slopes used best by sheep.

*Elevation:* In zone of succulent forage production better adapted to sheep or cows with calves.

*Conflicts:* Less adapted to cattle as hunting activity will disturb and drive them from range. Competition for aspen feed between sheep and deer.

## Conclusion

Range as a whole is adapted to sheep grazing because of the character of feed and ability of sheep to utilize forage farther from water.

## Problem 2:

### Conditions

*Range:* In southern Sierras. *Feed:* Deerbrush, black oak, peavine and well-sodded stringer meadows with willow and wet meadow sedges.

*Cover:* Small patches of timber. Cut-over area with many down logs and groups of ponderosa pines.

*Poisonous plants:* Small amount of larkspur and mountain laurel around one small marsh.

*Water:* Well distributed with none of the area over one mile distant therefrom.

*Soil:* Firm, rocky, clay, loam with few rock outcrops.

*Topography:* Rolling ridge tops with moderate canyon slopes becoming steep toward canyon bottoms.

*Elevation:* Ranges from 4500 to 7000 feet.

*Conflicts:* Deer population medium, hunting medium; highway crosses middle of range; there is no formal recreational use.

## Summary

*Feed:* Usable by either kind of livestock but higher utilization by cattle.

*Cover:* Better adapted to cattle.

*Poisonous plants:* Species toxic to both kinds in equal amounts, either can be eliminated at about the same cost.

*Water:* Suitable for either kind.

*Soil:* Suitable for either kind.

*Topography:* Usable by either kind but difficult to handle sheep in steep canyon bottoms; cattle will not utilize these areas to any extent.

*Elevation:* Range dries up fairly early and with little cover is best adapted for cattle.

*Conflicts:* Minor competition between sheep and deer for forage. Cattle congregate near highway. Cause threat to traffic. Hunting not critical.

### *Conclusion*

Range is preferable for cattle because of type of cover, and suitability of forage and water supply for that kind of livestock.

### **Problem 3:**

#### *Conditions*

*Range:* In south Sierras. *Feed:* Bunchgrass, wet meadow sedges, bitter cherry, aspen, whitethorn, woolly mules-ears and lupine, with a capacity of about eight acres per cow month.

*Cover:* Open Jeffrey pine and fir with stringer meadows and shorthair types on benches and gentle slopes with considerable weed feed on the ridges and open slopes.

*Water:* Abundant in all feed types.

*Soil:* Firm sandy loam on flats and benches and loose granite on lower ridges and slopes around meadows and benches, very rocky on higher ridges.

*Topography:* Wide-bottomed drainages with moderate slopes except for ridges at high elevations.

*Elevation:* From 6000 to 10,000 feet.

*Conflicts:* Fishermen and tourists use the area with a small number of hunters after September 16; need for reserving forage for small number of pack and saddle animals exists.

#### *Summary*

*Feed:* Well suited to either kind of livestock.

*Cover:* Well suited to either kind of livestock.

*Water:* Well suited to either kind of livestock.

*Soil:* Granitic soils are particularly susceptible to damage by sheep; cattle will damage granitic soil on edges of meadows.

*Topography:* 75% of feed area well adapted to cattle; entire cover usable by sheep except that numerous partial closures desirable because of soil conditions.

*Conflicts:* Minor with recreational use. Chiefly with saddle and pack stock.

### *Conclusion*

About equally adapted either kind.

### **Problem 4:**

#### *Conditions*

*Range:* On eastside of south Sierras.

*Feed:* At lower elevations sagebrush, bunchgrass and lupine, but most of feed at higher elevations of mixed aspen, snowberry, waterleaf, with small meadow stringers.

*Cover:* Aspen and few patches of lodgepole pine.

*Poisonous plants:* Consist of small amount of low larkspur at lower elevations.



*Water:* Is abundant and well distributed.

*Soil:* Firm, gravelly loam with a few small areas of gravelly sand on slopes of moraines.

*Topography:* 50% of area consists of rolling ridges and benches, the rest is moderately to quite steep with occasional rock outcrops and talus slopes.

*Elevation:* From 6000 to 10,500 feet.

*Conflicts:* Areas adjoining intensively used recreational sites ; horseback parties and fishermen use the area and there is a light hunting use after September 15.

### *Summary*

*Feed:* Particularly adapted for use by sheep with different elevational zones producing succulents throughout the season.

*Cover:* Hardly adequate for sheep resulting in overuse of areas providing shade except under careful management.

*Water:* Suitable for either kind of livestock.

*Soil:* Small areas susceptible to damage by sheep.

*Topography:* Little more than 50% of the area is usable by cattle ; all is usable by sheep.

*Elevation:* Well adapted to sheep ; fair for cattle.

*Conflicts:* Because of possibility of control and keeping livestock from adjoining recreational area is better adapted to use by sheep.

### *Conclusion*

Range should be assigned to sheep because of the character of feed, possible conflicts, and more suitable topography and elevation.

## **Problem 5:**

### *Conditions*

*Range:* On the west slope, south Sierras.

*Feed:* 65% is scattered in numerous small wet meadows ; the remainder in open ponderosa pine with lupine, honeysuckle and perennial bromes and fescues.

*Cover:* Open timber.

*Water:* Is abundant and well distributed.

*Soil:* Is fairly solid granite loam with occasional rock outcrops.

*Topography:* Rolling ridges with meadows, gently sloping and steep to rough canyon slopes with sparse vegetation.

### *Summary*

*Feed:* Particularly suited for cattle.

*Cover:* Either kind of livestock.

*Water:* Either kind of livestock.

*Soil:* Either kind of livestock.

*Topography:* Sheep can feed entire area but small grazing capacity in high canyon not usable by cattle.

*Elevation:* Valuable for lamb and calf production.

*Conflict:* No factor.

### *Conclusion*

Should be assigned to cattle because the feed is particularly suited to that kind of livestock.

### **Problem 6:**

#### *Conditions*

*Range:* On west slope of south Sierras.

*Feed:* Numerous small overused wet meadows throughout the range comprising 35% of feed with the rest under open Jeffrey pine, consisting of lupine, peavine, willow and fescue.

*Water:* Is abundant and well distributed.

*Soil:* Is firm, gravelly loam on slopes, rather unstable in meadows, with small areas of rocky and talus slopes, supporting fair stand of forage.

*Topography:* Is mostly rolling and moderately steep with small flats and benches with 15% of feed area on steep rocky slopes.

*Elevation:* From 5500 to 8000 feet.

*Conflicts:* Moderately hunted; main trail with heavy recreational use traverses allotment but no overnight camping on area.

#### *Summary*

*Feed:* Due to unstable condition of meadows, impossible for more than moderate use of allotment by cattle; sheep can secure full utilization of entire allotment except wet meadows which will be lightly used.

*Cover:* Suited to either kind of livestock.

*Water:* Suitable for either.

*Soil:* Best suited to use by sheep due to unstable condition of meadow. With cattle serious gully erosion would develop.

*Topography:* Best adapted to sheep.

*Conflicts:* Minor competition between sheep and deer for forage; possible to control or eliminate sheep use along trail as competition develops with recreation.

### *Conclusion*

While over one-third of forage area contains better cattle than sheep feed, in order to avert overuse and damage to meadows by cattle as well as to control possible conflicts with recreationists, area should be used by sheep. It is impracticable to zone the meadow to minimize damage, if allotment is used by cattle.

### **Problem 7:**

#### *Conditions*

*Range:* In the high central Sierras.

*Feed:* Wet meadow and shorthair with small percentage of palatable weeds.

*Cover:* Open lodgepole pine over 50% of area.

*Water:* Plentiful and well distributed.

*Soil:* Coarse disintegrated granite.



*Topography:* Broad flats with glaciated ridges, lava caps in heads of canyons, moderate slopes, very rocky with large granite boulders and cliffs interspersed with small pockets of deep soil accessible to cattle.  
*Elevation:* From 6500 to 9000 feet ; fishermen pack into area.

#### *Summary*

*Feed:* Adapted to cattle.

*Cover:* Suited to either kind.

*Water:* Suited to either kind.

*Soil:* Suited to either kind.

*Topography:* Superficially appears to be suited for sheep but in fact it is quite usable by cattle.

*Elevation:* Provides succulent feed in wet meadows and timber types and early maturity in shorthair ; hence better for cattle.

#### *Conclusion*

Range should be allotted to cattle on basis of character of forage.

### **Problem 8:**

#### *Conditions*

*Range:* On westside of north Sierras.

*Feed:* Meadow grasses, bluegrass, redtop, sedges and rushes, moist stream types, willows, cow-parsnip, arrowleaf butterweed, clover, skunkcabbage and lupine, with numerous small wet meadows and moist stringer types along stream courses and small basins and coves. Browse feed on hillsides of deerbrush, whitethorn, serviceberry. The principal source of feed is the meadow areas and stringer types, with considerable browse feed on timbered hillsides and ridges.

*Topography:* The lower part is broken by deep precipitous canyon drainages with small meadow areas occurring along the canyon bottoms, while the upper part of the range is a series of small basins and flats with rolling ridges between drainages.

*Water:* In permanent streams abounds in all except minor drainages with numerous springs emerging from sides of the canyons.

*Soils:* Shallow, residual clay loam, with rock outcrops and slides along canyon walls.

*Elevation:* Ranges from 4500 to 8000 feet.

*Poisonous plants:* Waterhemlock occurs in small amounts in the moist portions of several large meadows and lupine is scattered throughout the timber type but is very sparse ; the streams are fished occasionally, since they are accessible only by trail.

#### *Summary*

*Feed:* Suitable for cattle.

*Cover:* Adapted to either.

*Water:* Adapted to either.

*Soil:* Adapted to either.

*Topography:* Suitable for cattle.

*Elevation:* Suitable for cattle.

*Conflicts:* None.

### *Conclusion*

Range should be allotted to cattle on basis of character of feed.

### **Problem 9:**

#### *Conditions*

*Range:* In the northeastern part of California.

*Feed:* Bitterbrush, wheatgrass, Idaho fescue, sunflower, lupine and sagebrush, and occurs as an understory in an open stand of ponderosa pine containing only small amount of reproduction.

*Water:* Is poorly distributed and confined to one well and three stock tanks, but with 50% of the range within one and one-half miles of water, 30% within one and one-half and two and one-half miles, and 15% between two and one-half and four miles of water.

*Soil:* Is a firm loam.

*Topography:* Is flat.

*Elevation:* Averages 5000 feet.

*Conflicts:* There is serious competition between deer and domestic livestock, and a substantial percentage of the browse feed must be left for deer.

#### *Summary*

*Feed:* More suitable for cattle.

*Cover:* Adaptable for either kind.

*Water:* Not well distributed and in the absence of development can only be used by sheep.

*Soil:* No problem.

*Topography:* No problem.

*Elevation:* No problem.

*Conflicts:* Same problem with either kind but perhaps more serious with sheep.

#### *Conclusion*

Available forage, altitude and topography are best suited to cattle grazing. Lack of well distributed watering places forces present use of the range by sheep. Sheep can use dry area when forage is green and areas within two miles of water when forage is dry. When stock water is fully developed, range will become an excellent cattle range.

### **Problem 10:**

#### *Conditions*

*Range:* West Sierra foothills.

*Feed:* Wild oats, soft chess, alfalfa, bur-clover, wedgeleaf ceanothus, birchleaf mahogany.

*Cover:* Chiefly open widely scattered blue oak, digger pine and canyon live oak. Occasional patches of dense thickets of brush, manzanita and live oak on the north canyon slopes. Entire range used heavily in winter by deer.

*Topography:* Rather rough, deep canyons, but moderate slopes on south exposures, somewhat steep on north exposures.



*Soil:* Shallow, igneous origin, covered with lava rocks.

*Water:* In permanent streams in the main drainages with numerous springs in side drainages which are semipermanent drying up in dry years. Distance between water not over two and one-half miles.

### *Summary*

*Feed:* Suited to spring, fall, or winter for sheep, any season for cattle.

*Cover:* Suited to both kinds of livestock.

*Topography:* A little more accessible to sheep, but both kinds of livestock can use it.

*Soil:* Soil shallow and light texture more subject to damage by sheep.

*Water:* Well distributed. No factor.

*Elevation:* Extremely hot temperatures, so can be used by sheep only during spring, fall and winter.

*Poisonous plants:* No factor.

*Conflicts:* Sheep are more in conflict with deer than cattle.

### *Conclusion*

Allot to cattle because of deer conflict and soil conditions as well as possibility of late spring and early fall use.

### **POINTS DEVELOPED BY PROBLEMS**

1. Cattle prefer grasses to weeds. Problems 2, 5, 7, 8, 9.
2. Sheep prefer succulent weeds to grasses. Problems 1, 2, 4.
3. Sheep require shade for resting grounds. Problems 1, 3.
4. Cattle can use range without timber cover. Problems 2, 8.
5. Cattle can use range containing windfalls, extensive burns and brush thickets. Problems 2, 3.
6. Poisonous plants must be considered in determining kind of livestock for which range is adapted. Problem 2.
7. Cattle drink daily hence should not travel over one-half mile in steep country or one mile in open rolling country. Problems 2, 3, 4, 5, 6, 7, 8.
8. Sheep can go without water for days if feed is succulent but require a large supply when watering in order to expedite watering them in bands. Problems 1, 9.
9. Sheep damage loose soil. Problem 3.
10. Cattle damage meadows by wearing trails in them and by breaking the sod. Problem 6.
11. Cattle use rolling or level country to advantage. Problems 5, 7, 8.
12. Sheep can use the rougher and steeper country. Problem 4.
13. Sheep prefer higher elevation where plants retain succulence until late in season. Problem 4.
14. Cattle are more difficult to keep from conflicts with recreationists and wildlife because they are not herded. Problems 3, 4, 6, 10.

### **CHANGE IN KIND OF LIVESTOCK NEEDED**

Cases arise in which conditions in the range itself, or in its partial use for purposes other than domestic livestock, indicate that a change in kind of livestock is needed.

**Problem 1:**

Soil rebuilding program planned on eroding meadows.

*Conditions*

A cattle range; meadows long shoestrings, eroding badly. They are highly important in the whole allotment, but there is much hillside feed. Program planned for rebuilding meadows, but fencing difficult.

*Action*

Either fence eroding areas or change from cattle to sheep during period of meadow restoration.

*Why*

Sheep can be kept away from meadows during this period. Cattle cannot be herded away, and protection of meadows from use essential during period.

**Problem 2:**

Additional water development makes range occupied by sheep, but better suited and more needed by cattle, usable by latter.

*Conditions*

Sheep have been permitted on range having poor distribution of water but otherwise better adapted to cattle. Dependency of cattle business much higher than of sheep. Water developments made.

*Action*

Change to cattle.

**Problem 3:**

Critical interference by cattle of concentrated recreational use, and fencing impracticable.

*Conditions*

In U-shaped canyon with long narrow meadow strip, road development has resulted in development of area of intensive recreational use. Cattle unavoidably are a constant source of trouble. Impracticable to fence because rough rocky canyon sides coming to edge of meadow make cost prohibitive.

*Action*

Try to get another range for cattle permittee. Then permit use of side slopes by sheep, with stipulation to keep away from canyon floor.

**Problem 4:**

Range used by sheep in which browse destroyed or greatly reduced and replaced by grasses.

*Conditions*

Preference for sheep has developed through prior use on a range at



one time equally adapted to cattle or sheep. The increase in the number of deer and full utilization by sheep have resulted in a marked reduction in the amount of bitterbrush and an increase in the bunchgrasses. A change in kind of livestock is needed to maintain or improve the balance between the two main classes of forage plants.

#### *Action*

1. Assign sheep to more suitable allotments as vacancies occur.
2. Permit cattle on range.
3. Adjust season of use (if feasible) to one in which minimum use of browse obtains.
4. Reduce livestock numbers to a point that browse species will be at least maintained.

#### **Problem 5:**

Range used by both kinds of livestock.

#### *Conditions*

Permits for both cattle and sheep on same allotment. Both kinds graze a certain group of plants which are therefore decreasing. Species used by only one kind are in satisfactory condition.

#### *Action*

Decide on kind of livestock to which whole allotment best suited. Pick up allotment elsewhere and transfer permit for other kind to it. Permit only one kind on range thereafter. Do not increase permitted number till injured species come back.

## **SETTING GRAZING CAPACITY DEFINITION**

The grazing capacity of each range should be set at such numbers of livestock as will allow maximum use of the forage consistent with adequate protection to watersheds and other public values. In order that excess damage does not occur in the poor year, capacity should be set on basis of a slightly below average forage year.

## **CHECKING GRAZING CAPACITY IN A SPECIFIC YEAR WHEN AND WHAT TO INSPECT**

Inspecting a range to determine grazing capacity is best done at the time the livestock leave in the fall. Obviously this is not always possible. A satisfactory job can be done up to three weeks before the close of the grazing season, but not much more than a week after. Fall storms often heal over some of the scars and evidence of degrees of use and quickly become less clear-cut. Experience, exploration, or the advice of other forest officers and the stockmen determine the most effective method of sampling each range for the purpose of securing data needed for its future management.

The inspection job must be done on a sampling basis covering:

1. Each important forage type.
2. A few salt grounds.
3. Each elevational zone.
4. The least used areas.
5. The heavier used areas.
6. The natural hangouts.

The inspection will lead to conclusions on:

1. The level of management of livestock.
2. The general degree of use and the utilization type by type or area by area.
3. The areas that should not be considered in determining grazing capacity or only partially considered.
4. Needs for improving handling.
5. Needs for structural facilities.
6. True range capacity.

#### **USE OF UTILIZATION STANDARDS**

The visible marks which indicate for each major range type whether the utilization has been satisfactory or too close, are well known. They are set forth in detail in the section of the Handbook dealing with the types. Systematic observation of these indices is the key to accurate appraisal of the grazing capacity and of current use.

#### **JUDGING NORMALITY OF THE YEAR**

The fall inspection to check grazing capacity needs to be based on knowledge of the character of the particular year as to forage production. Was production high—"a good year"—or low—"a poor year"—or about average? Clearly, the very good or very bad year is not the best occasion to judge capacity.

Everyone knows that in a general way forage production varies with both amount and distribution of precipitation and its coincidence with growing temperatures. But what particular combination of the weather elements means "normal" forage production, and which means "good" or "bad" production in the main range types is not known, even after the season is over.

At present then, rough rules of thumb and general judgment have to be relied on. These include:

1. A winter of light snowfall is likely to be followed by a season of less than normal forage.
2. A grazing season opening early is likely to be one of subnormal forage.
3. Drying up of usual springs, seeps, or streams generally means a subnormal year.
4. Appearance of new springs and seeps usually means an above normal year.
5. Condition of livestock on leaving range is not in itself a safe measure of the season. Good condition may result with overuse of range that year.



6. The general appraisal of forest officers with experience in range management for some years on the forest is not to be overlooked.

## PROBLEMS IN DETERMINING GRAZING CAPACITY

### Problem 1:

How to determine the grazing capacity of a small enclosed range.

#### *Conditions*

Permittee has a special use pasture adjoining his ranch property on the forest boundary; type wet meadow; area 60 acres in which 15 head of cattle were permitted for season June 1 to September 30. Records indicated it was being overused and on August 1, on inspection, it was found that 12 head of cattle had been in the pasture continuously since June 1. The use showed to be close but spotty with lightly grazed sedges around old cow chips, and a small amount of moderately grazed but palatable plants throughout the meadow. The hooves of the cattle were only partly masked by the vegetation and the soil was drying out to the extent that further growth was not anticipated. The year is an average one. Full use of the range had been made at the time of the inspection.

#### *Action*

Record was made that a reduction should be recommended in the numbers of livestock permitted next season to the equivalent of the actual use up to the time of the inspection. As an immediate step make an effort to get the permittee to carry as small a number of cattle in the pasture as he possibly could for the rest of the grazing year.

#### *Why*

The forage conditions at the end of the two months of use by 12 head of cattle were what they should have been at the close of the season. A grazing capacity of 6 head of cattle rather than 15 for the four-months period was indicated.

### Problem 2:

How to check on the grazing capacity of a cattle range.

#### *Conditions*

The range lies on the eastside in the pine type. The forage type was quite uniform. Topography level. Area of range 10,000 acres. Permitted number of cattle 200 head for season June 1 to September 30. There are four springs in the area which are permanent and are developed. They are well located over the range so in no case does livestock have to go over one and one-half miles for water. On September 10 the district ranger made an inspection which showed the following conditions: Use of forage was quite uniform for distances slightly over a mile from water. The bitterbrush was fairly closely grazed. One-fourth of the young shoots were untouched. Half of the perennial grass in the openings is unused, and grass under shrubs is almost untouched.

In looking over the landscape, pine cones are inconspicuous; old cow chips are scarcely visible; the soil surface is disturbed only in the immediate vicinity of the watering places and on the well frequented cow trails. On the outlying portions of the range there is notably lighter use in spite of unusually good salting practices which attempted to get proper utilization. The season was considered to be average as to range conditions.

### *Action*

It was concluded that the range was fully utilized on September 10 after 100 days' use by 200 head of cattle. This would indicate a grazing capacity of 167 head for the 120-day permitted season. After a careful analysis of the previous range inspection reports which showed similar conditions, the ranger determined to recommend that the number of cattle permitted on this range be reduced to 167 head.

### *Why*

The range was in the condition as to utilization on September 10 that it should not have reached before the end of the season. Further grazing in order to obtain full utilization of the outlying areas would only have resulted in the overuse and consequent deterioration of areas near water.

## **Problem 3:**

How to determine the grazing capacity of a sheep range.

### *Conditions*

A high Sierra sheep range has a good mixture of types and a high percentage of succulent feed. The grazing season is July 1 to September 30 for one band of 1200 sheep. An inspection of the allotment was made on September 15. It was found that a very satisfactory job of handling sheep had been done. The burro system of herding had been used and the condition of the bed grounds indicated the practice of the one-night bed rule. This was verified by the herder's statements. Approximately three-quarters of the allotment had been grazed and there remained one open range of fairly dry feed composed of browse, grasses, woolly mules-ears and lupines with a few moist stringers with sedges and western false-hellebore. There was no indication that the area covered up to September 10 was overutilized but further grazing there was clearly not desirable.

### *Action*

The ranger located the herder and discussed with him the handling of sheep on the range for the rest of the season. He learned that the lambs had just been shipped and that use was about to start on the open ridge. It was agreed that this feed would be satisfactory for the dry sheep and sufficient to carry them until the end of the permitted grazing season.



## *Why*

Examination showed that the range was stocked according to its grazing capacity but the best possible type of management was required if that rate of stocking was to continue.

### **Problem 4:**

How to determine the grazing capacity of a range not uniformly used.

#### *Conditions*

The range consists of wet meadow types well mixed with large ponderosa pine and bunchgrass types of rolling to fairly steep topography. 320 head of cattle are permitted from June 1 to October 15. Approximately 50% of the grazing capacity is in the wet meadow and the remainder rather uniformly distributed throughout the ponderosa pine type. Here the soil is a firm, gravelly loam but in the meadows it is rather loose and is subject to gullyng. On October 6 the ranger rode on the fall round-up and on October 10 the cattle were removed from the range. On this ride he covered most of the meadows and went over samples of the timber type in all portions of the range. He found good salting practices in effect with some salt left in nearly all salt boxes. Salt grounds were well posted and located on ridges and benches away from the meadows in an attempt to draw cattle to feed areas they would not use otherwise.

However, much of the perennial grass was left unused. No use of the bitterbrush was visible from a distance. Few cow tracks were in evidence and pine cones and like objects were usually hidden by the ungrazed grasses. On the other hand the meadow areas had the appearance of a closely clipped lawn. Objects the size of a golf ball were visible at a long distance and the only unused vegetation was around the previous year's cow chips and the heads had been clipped from this. Along the watercourses, the banks were broken down in numerous places, the tracks of cows' hooves were common, and at the lower end of the meadows the water had a roily appearance. The channel bottoms were of coarse gravel and no cutting was visible except toward the lower end of 3 out of 14 meadows visited. Here the channels had cut down from 2 to 3 feet and had worked back into the meadow for from 50 to 100 feet. A few small side stringers were developing. Throughout most of the meadows there were broken places in the sod, particularly evident on low natural mounds of dryer soil. Along the edges of all of the meadows the stand of forage was quite thin and consisted of bunchgrasses, woolly mules-ears. No seed stalks were left on these grasses and about half of the herbage of the woolly mules-ears had been grazed. The willows along the watercourses showed a distinct grazing line. Office records disclosed similar reported overused meadow conditions for several previous years.

#### *Action*

If possible fence the meadows. Then leave number of cattle un-

changed. Either use the timber types only for first half of grazing season and meadow types for the last half, or class the cattle and use the pine types for dry stuff only and meadows for cows and calves only.

If fencing is not feasible, reduce number of cattle to the grazing capacity of the meadow types plus only incidental credit given to forage contribution from other types.

If damage to meadows continues, prepare to change kind of livestock.

### *Why*

The meadows are seriously overused with erosion started in water-courses, soil is breaking down, and the stage is set for serious damage and rapid deterioration. The ponderosa pine bunchgrass type is but lightly grazed and since good management practices are in effect it cannot be expected that better utilization of these areas can be obtained without fencing.

### **POINTS DEVELOPED BY PROBLEMS**

1. Since control of number of livestock using fenced ranges is easy, every determination of grazing capacity in such areas should be followed by prompt action to make indicated adjustments. Problem 1.
2. Prompt steps should be taken to correct stocking where this is above the grazing capacity. Problems 1, 2 and 4.
3. Conditions of ranges and grazing capacity data can be secured from a study of the conditions as to utilization of the principal plants. Problems 1, 2, 3 and 4.
4. The stocking of a range of diversified types must be based on the grazing capacity of all of the types and should not be heavy enough to damage any type. Problem 4.
5. Capable range management is required to permit utilization of ranges to their full grazing capability. Problem 3.

## **SETTING RANGE BOUNDARIES**

### **DESIRABLE CHARACTERISTICS**

To meet the permittees' objective of securing greatest gains in the weight of their livestock, the area to be used should have forage maturing continually throughout the grazing season if possible. An individual range allotment therefore should contain a balance of early and late feed. This means a combination of types and both lower and higher elevations.

The minimum size for an economical cattle operation should be a unit supporting 200 head; the maximum 500 to 1000 head. Permittees running 200 head of cattle or over should have individual allotments if feasible, in order that a sense of possession and responsibility may develop a keener interest in the care and improvement of the range and the forage. For sheep, allotments should be of such size as to support one full band of ewes with lambs.



Cattle allotments should be bounded by topographic features which will aid naturally in controlling the livestock. The ideal allotment is a basin or watershed surrounded by natural barriers and so watered and divided with minor barriers as to maintain good distribution with a minimum of riding and herding. High rocky ridges, deep rough canyons, and extensive areas of dense timber or chaparral make good allotment boundaries. The possibilities of tying short stretches of drift fences in with existing pastures, farms, or natural barriers often governs the boundary of an allotment.

For sheep, barriers are not essential in the sense used above. The boundary when not on a barrier must be on a ridge or other line to which sheep can be grazed under the open herding method and without bunching or excess use of dogs. Boundaries should not be laid out along slopes, across small drainages, or bisect small areas of high grazing capacity. Sharp angles and jogs should generally be avoided. The location should consider the possibility of handling livestock on each side of the line and the existing use will indicate many desirable features of boundary location. The rougher unused areas on the edges of cattle allotments may occasionally be fed by sheep.

In the relocation of allotment boundaries, prior commitments of the Forest Service and agreements between stockmen should be given attention.

Allotment boundaries should be clearly posted to prevent confusion and possible trespass.

## **IMPROVEMENTS NECESSARY FOR CONTROL OF LIVESTOCK**

On many cattle allotments natural barriers are not sufficient to confine the livestock to the allotment. It then becomes necessary to provide adequate control by riding or fencing. Fences should be so located that in the event of change of livestock ownership they will continue as boundaries. Fencing of boundaries in gently rolling country requires a knowledge of cattle habits and consideration of factors such as location of water, barriers of rim rock and other natural features the use of which will reduce fencing costs. A good working principle is to have allotment boundary fences in line with the country and not at right angles to the drainage.

In locating proposed boundary fences, attention should be given to the existing and proposed road system. Roads should be crossed as little as possible to avoid the necessity for expensive cattleguards or to obviate the difficulties of gates being left open. In fenced enclosures for pastures or for protecting recreation areas, provision should be made for the movement of livestock around rather than through them.

### **Problem 1:**

How to prevent excessive drift from one section of an allotment to another.

#### *Conditions*

Six ranchers with a total ownership of 480 head of cattle use in common an area of 20,000 acres. The area is traversed by two streams

separated by a high ridge. The ridge, though steep and precipitous the greater part of its length, has a number of low gaps through which cattle drift. As this drift tends more to the southern and smaller of the two drainages, regular and frequent riding on the part of the ranchers is required to keep their cattle properly distributed between the two drainages. The riding is not systematic.

### *Action*

1. An appraisal of the situation on the ground by the ranger and permittees.
2. Determine if the area can be equally divided into two allotments acceptable to all concerned.
3. Ascertain whether means other than fencing or employment of regular rider will solve the problem.
4. Appraisal of fencing required to close gaps to drift and comparison of fencing costs to cost of employment of a rider.

### *Solution*

Examination on the ground demonstrated to the ranger and the ranchers that good feed areas on the south side of the ridge near the summit would always attract too many cattle from the north side unless checked. The area tended to hold livestock rather than to afford stopping places in a normal back and forth drift. There was enough drift, however, to cause individual owners considerable riding to keep track of their own livestock. It was agreed that four and one-half miles of wire fencing were required to effectively close the several gaps at a cost of \$350 per mile or a total of \$1575. The group considered the employment of a rider for a five-month season at an overall cost of \$80 per month too heavy an annual outlay as the ranchers themselves could handle their livestock if the drift were stopped. After some minor horse trading in numbers the ranchers agreed that two of their number would take over the south half and the other four occupy the north half. The decision to divide the area into two allotments by fencing the gaps was approved by the ranger, as it was not only in the interest of the ranchers but was distinctly advantageous to his grazing administration.

## **SETTING OPENING DATES**

The authority for setting the opening (and also the closing) dates of the grazing season rests with the Forest Supervisor. The approval of the Regional Forester is not required for special seasons.

Too early use is fully as damaging to range as overutilization. Trampling packs wet soil, speeds up the drying-out processes, and thereby reduces later growth. It injures roots and root crowns. Grazing perennial herbaceous species while growth is being made from food stored in the roots weakens the plants and later growth is affected. This early growth has little nutritive value. In the annual grass types, where dry forage is taken



with the green, livestock will make gains during the early growth stages of vegetation.

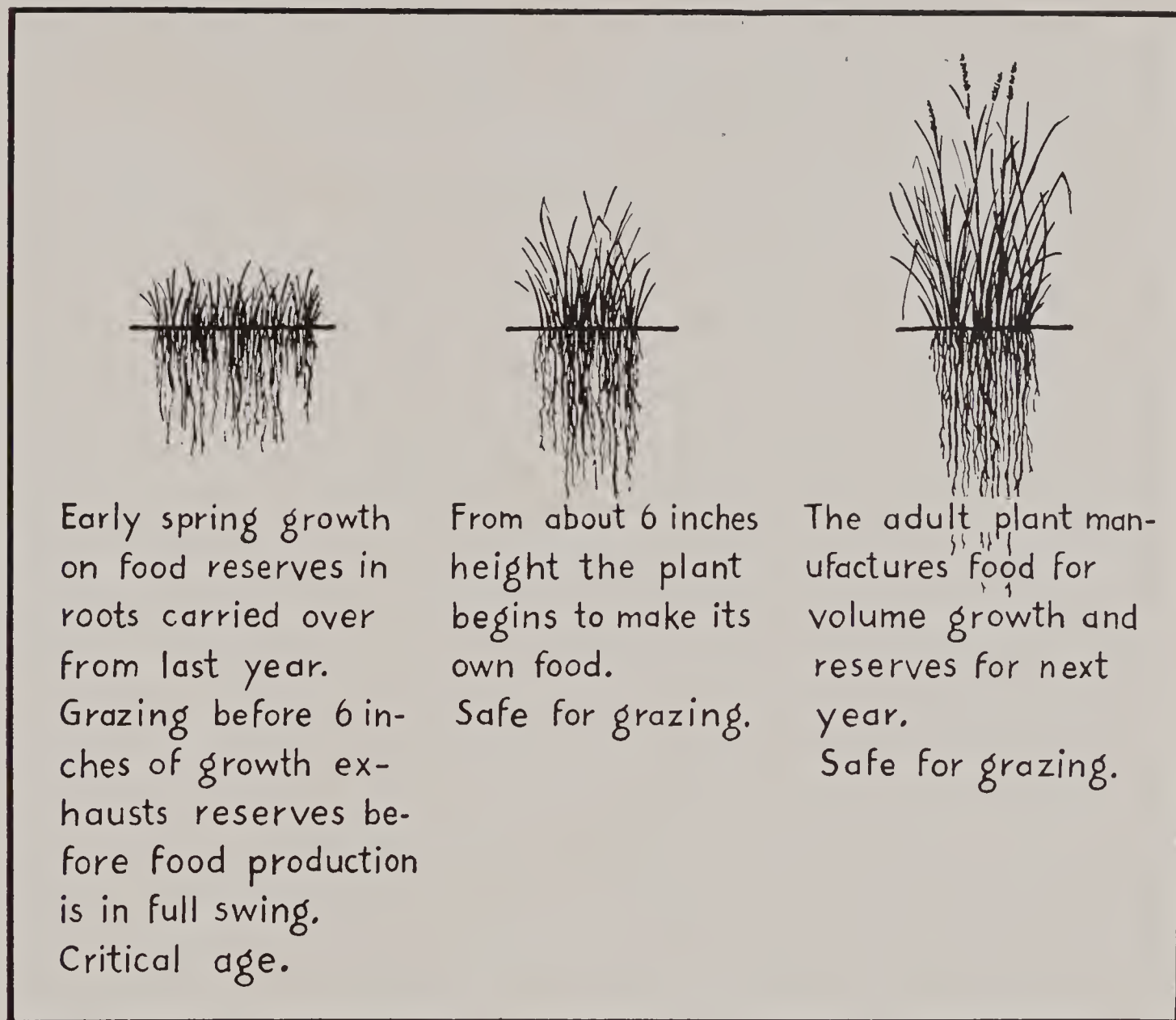


Figure 14.—PLANT DEVELOPMENT AND SEASON OF GRAZING ON BUNCHGRASS RANGE

Safe opening dates are set by the condition of the soil and the stage of growth of the vegetation; that is, the condition of key species which experience shows marks the time after which normal grazing will not injure either plants or soil.

## **SPECIES AND GROWTH STAGES INDICATING SAFE CONDITION OF RANGE**

### **ANNUAL GRASSES**

In annual grass types the grasses should be from 3 to 4 inches high on fertile soils and from 2 to 3 inches high on poor soils or on exposed sites.

### **PERENNIAL GRASSES**

Sandberg bluegrass (G 106), at least 10% in head; other bunchgrass conspicuously in the boot.

Wheatgrass (G 1), 6 inches tall.

Shorthair or threadleaf sedges (GL 5), brown flower heads showing.

## PERENNIAL HERBS

Waterleaf (W 98), faded.

Woolly mules-ears (W 207) and balsamroot (W 43), beginning to bloom.

Western false-hellebore (W 201), beginning to bloom.

Aster (W 31), in bud.

Pentstemon (W 144), in bud.

Lupine (W 112), basal leaves full size.

Buttercup (W 161), faded.

Senecio (W 168), leafage mature, beginning to blossom.

Dandelion (W 103), in blossom.

Yarrow (W 1), flowering stocks beginning to show.

## BROWSE

Bitter cherry (B 115), part of blossoms out.

Serviceberry (B 12), part of blossoms out.

Deerbrush (B 44), part of blossoms out.

Bitterbrush (B 116), part of blossoms out.

Whitethorn (B 40), part of blossoms out.

California black oak (*Q. kelloggii*) (B 123), first leaves  $\frac{3}{4}$  developed.

Brewer oak (B 117), first leaves  $\frac{3}{4}$  developed.

Wedgeleaf ceanothus (B 41), in full blossom.

Snowberry (B 151), in bud.

## SELECTING OBSERVATION AREAS

Rate of plant growth varies widely and may differ as much as thirty days within a period of years. In order to give consideration to such variations it is necessary to find the average date of vegetative readiness for each range allotment over several seasons. This is determined from careful analysis of the phenological (plant development) observations recorded at the designated points set up as representative of the range. The permitted opening date is then set on a conservative basis which is ordinarily a few days later than the average shown from the vegetative readiness records. This is done in order that it will not result in too early grazing in late seasons. In the one delayed year which may come in about every five, the supervisor, through the agreement on the permittee's application, may delay the opening date as much as fifteen days. He also has leeway to grant an advance up to fifteen days in date of entry, when conditions show that such action is justifiable.

## Uniform Types

*Allotments of uniform forage types with slight differences of elevation:* Select four to five permanent observation points representative of types, soils, growth conditions, exposure, and cover. No plots are required but designation should be made of the points by local landmarks such as signposts, road or trail forks, salt boxes, mail boxes, distinctive trees, etc. Examine a sample of about an acre in extent around each point and record the essential facts on the range inspection sheet. Take observations two or



three times each spring from each point. The first of these should be timed to come about two weeks before the established opening date unless it is obvious that a very early opening date is probable, when an earlier examination would be necessary. Make the second observation a few days before the date when the previous examination indicated the range should be ready. Study the results and advise permittees when they can bring their livestock on. Observations on one range can be used if clearly typical of conditions on similar adjacent ranges in determining the date of entry on these. Make a third examination when the second does not give basis for final action.

### **Complicated Types**

*Allotments with several major forage types and with considerable elevational range:* Consideration must be given to the areas livestock will feed for the first two- to four-weeks' period. This is generally at least one-third of the allotment for cattle and less for sheep. Select observation stations as previously outlined that are representative of conditions in this portion of the range, since vegetative readiness must have been reached on such areas before the allotment can be opened. In other words, the more backward types of forage, sites, exposures and elevations on the portion of the allotment grazed first must be used as the key to readiness, and conditions on such areas must have reached the standards set or the allotment is not yet ready. This is particularly important when poisonous plants, such as low larkspur on cattle ranges or deathcamas on sheep ranges, are present. There must be sufficient palatable forage available so that the stock will let the poisonous plants alone. After the observations are taken they must be analyzed and the date of entry set on the basis of the readiness of the more backward types on portions of the range to be used. The observations taken can be used to determine the readiness of similar types, sites, exposures and elevations in other adjacent ranges. The observation records should be kept from year to year so they can be used in checking the correctness of the established opening dates.

## **PROBLEMS IN SETTING OPENING DATES**

### **Problem 1:**

How can the date on which stock should be permitted to enter a range allotment be determined for any given year?

#### *Conditions*

On examining a bunchgrass, dry meadow range about May 1, the ranger found from a comparison with previous years that the country was drying out rapidly and forage was considerably more advanced in growth than was normal, due to the early opening up of spring and the warm temperatures. Indications then pointed to the probability that instead of the range being ready for use by June 1, the date set in the permits, it would be usable by May 16. A second examination on May 12 disclosed that well over one-fourth of the bunchgrass showed flower heads, while the soil was getting dry and firm.

### *Action*

The supervisor notified permittees who had requested early entrance that they would be allowed to bring in their livestock not earlier than May 16.

### *Why*

With an early season in the mountains, conditions on the valley home ranches may become such that there is often a definite need to move the livestock to its summer range as early as is practicable. The national forests can meet such an emergency under the authority granted by the Regulations to permit earlier than normal use.

### **Problem 2:**

What should be done to prevent damage to the range when field study shows it is not yet ready for occupancy?

### *Conditions*

Previously designated points of observation in a range that consists largely of annual grass and woodland on which permits had been issued providing for use by April 1 were examined on March 20. A cold spell had been in progress, followed by a heavy rain. It was found that on the north slopes the annual grasses had made almost no growth since the previous examination and they were not less than an inch high. In quite a few places the examining officer's horse slipped and slid. On the south slopes the grasses were perhaps three inches tall and the range was well dried out.

### *Action*

Based on the fact that the more backward forage would not be ready for use on April 1, the supervisor instructed the permittees to hold off their livestock for a few days, under the agreement in their grazing application, until a second examination could be made and conditions found to be such that the range could be occupied without damage.

### *Why*

The readiness of the most backward portions or types of a range to be used when livestock enter the forest should be the indicator by which the date of entry of livestock should be set.

### **Problem 3:**

How can the correctness of the grazing permit opening date for any given range be checked?

### *Conditions*

The district ranger found on his first year's assignment to a new district that conditions justified permitting the cattle in the Blackhawk range to enter on May 16. The date on the permits was June 1. He learned from local residents that the year was a little advanced but felt he ought to check to be sure the proper opening date was in effect. He



studied the observations made by his predecessors on vegetative readiness of this range for the past ten years and found that in all but two years the range was ready to be occupied by about May 25. In one other year it was ready by May 16.

#### *Action*

None, except to record the analysis made.

#### *Why*

The permit date corresponded closely to range readiness.

### **POINTS DEVELOPED BY PROBLEMS**

1. When detailed records of vegetative readiness show ranges are ready for use, permittees should be notified. Problem 1.
2. Ranges should not be opened to grazing until the most backward forage type in the area to be utilized in the early season is ready for use. Problem 2.
3. Opening dates should be altered only after careful analysis of a series of years' records. Problem 3.

### **SETTING CLOSING DATES**

Closing, like opening dates, depend primarily on stages of the vegetation. The more the animal husbandry scientists study the relation of livestock condition to fall growth stages of plants, the more clear it is that the practice of leaving livestock on the range far into the fall, is poor economics.

### **CATTLE RANGES**

#### **EFFECT OF LIVESTOCK ON THE RANGE**

The break from summer to fall reduces both plant palatability and nutritive qualities and seems to result in drawing cattle successively to certain types.

As a result on many ranges by the middle of October there will be excessive concentration and utilization of wet spots. Regardless of the stocking of the range as a whole this means overstocking of the concentration points from then on. Since meadows and stringers are, of all types, most susceptible to damage by trampling in late fall, such use is apt to develop permanent injury. On ranges of more uniform type the use will be concentrated on the remaining nutritious or succulent species, leading to overuse of these. In the ranges with a combination of types, management becomes progressively more difficult and finally impossible without excessive fencing. At this time watering places become fewer in number, increasing the problems of management and localized overuse. Of course when fall rains have softened the soil to an extent that trampling occurs, it is obvious that grazing should be terminated. This becomes a major factor in the belts or seasons of high rainfall.

## EFFECT OF RANGE ON LIVESTOCK

To gain weight cattle require certain food qualities in combination:

1. Vitamins.
2. Roughage.
3. Digestible nutrients.
  - a. Fat, b. Protein, c. Carbohydrates.
4. Minerals.

Each plant species eaten has at one time or another during the year one or more of the qualities. In forage species the qualities fluctuate seasonally.

On good ranges, such as cut-over ponderosa pine of the eastside and the associated dry meadows and sagebrush-bunchgrass type, the combination of all plants eaten by cattle results in net gain in weight. Gain is highest early in the grazing season and decreases thereafter. At about the time when summer changes to fall, around the end of September, the quality of the

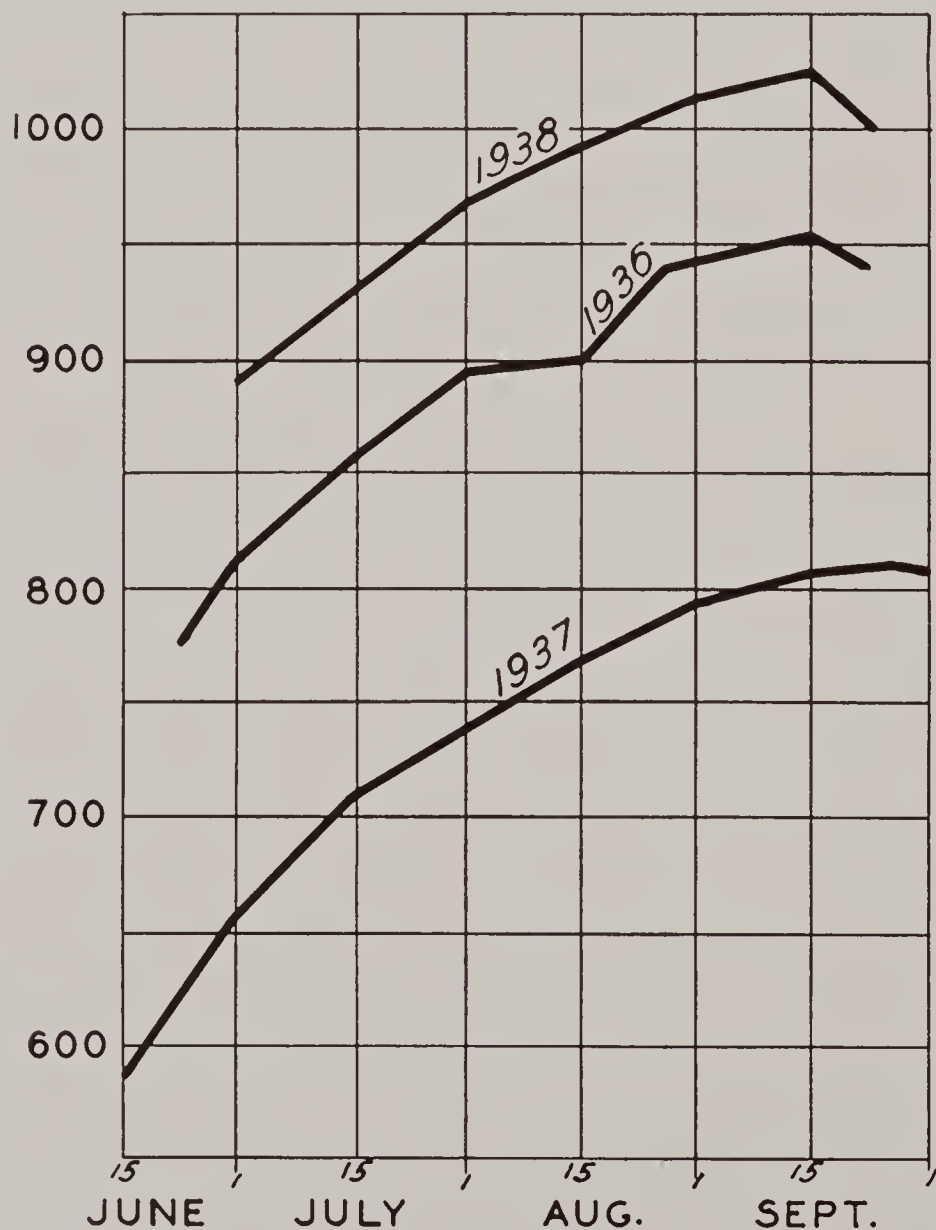


Figure 15.—TREND OF CATTLE WEIGHTS ON EASTSIDE PONDEROSA PINE-BUNCHGRASS TYPE FOR 3 SEASONS 1936-1938  
(BURGESS SPRING—LASSEN NATIONAL FOREST—CALIFORNIA FOREST AND RANGE EXPERIMENT STATION)



range has decreased to the point where gains in weight change to losses in weight. Even though the range is but lightly used, continued use from this point on results in accelerated rate of weight loss. (See Figure 15.) Further use is therefore uneconomic. At this time aspen leaves have started to turn color ; woolly mules-ears are completely dried up ; skunkcabbage has turned brown and is falling to the ground.

In the deerbrush type of the west central Sierras the seasonal course of weight gains of calves and steers starts high at the beginning of the grazing season (June 1), decreases slowly until mid-August when the leaves begin to turn color, and then drops abruptly within a very short period to loss in weight which continues at an accelerated pace thereafter. Cows maintain their weight until August 15 and lose weight thereafter. (See Figure 16.) The use of this range type after the critical point in mid-August is also uneconomic.

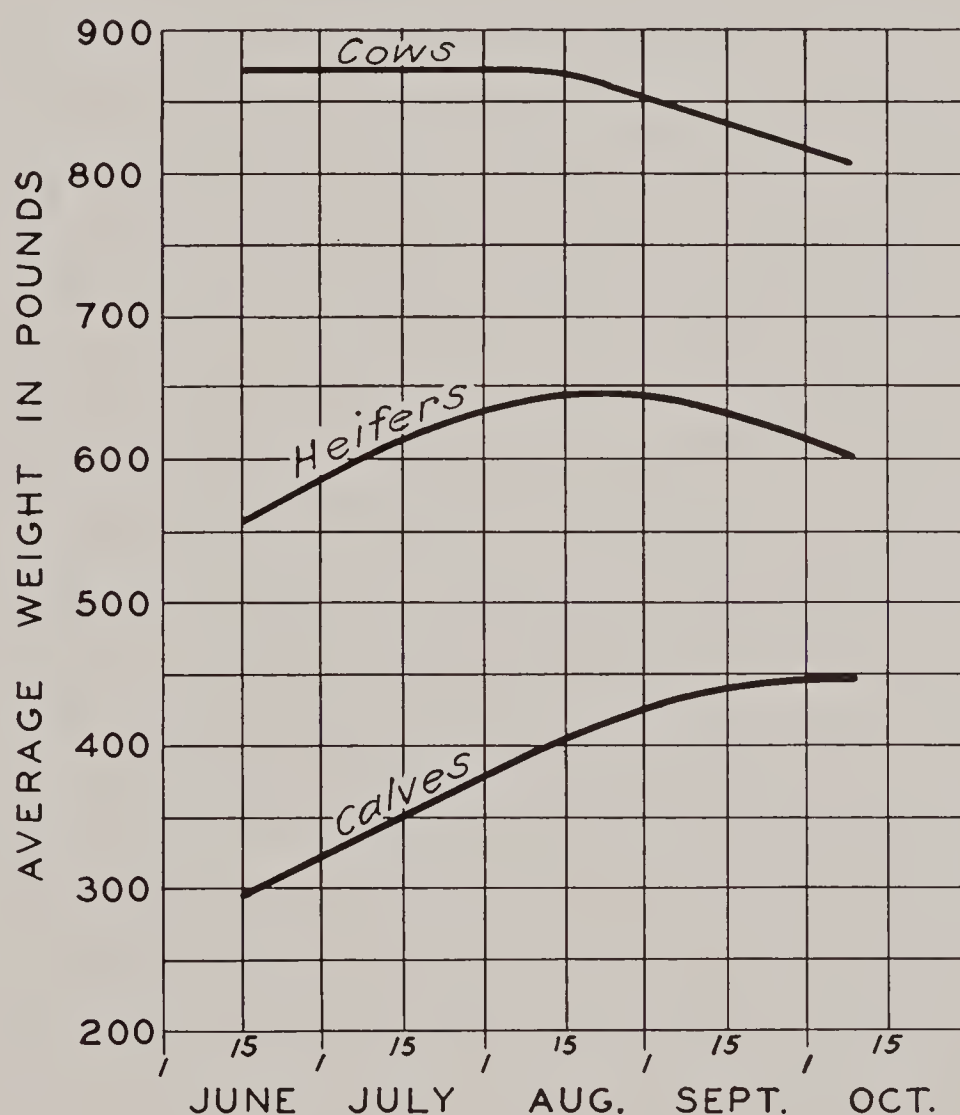


Figure 16.—APPROXIMATE TRENDS OF LIVESTOCK WEIGHTS ON DEERBRUSH RANGE—3 SEASONS' STUDY 1935-1937 (TAHOE NATIONAL FOREST) FROM UNPUBLISHED MANUSCRIPT BY G. H. HART AND H. R. GUILBERT.

On annual grass ranges of the Sierra foothills cattle must either be removed to better feed in July or else supplemented if they are to maintain their weight. Figure 17 shows that cows on the San Joaquin Experimental Range began losing weight in July in 1937, but by the use of supplements weights improved until calving time.

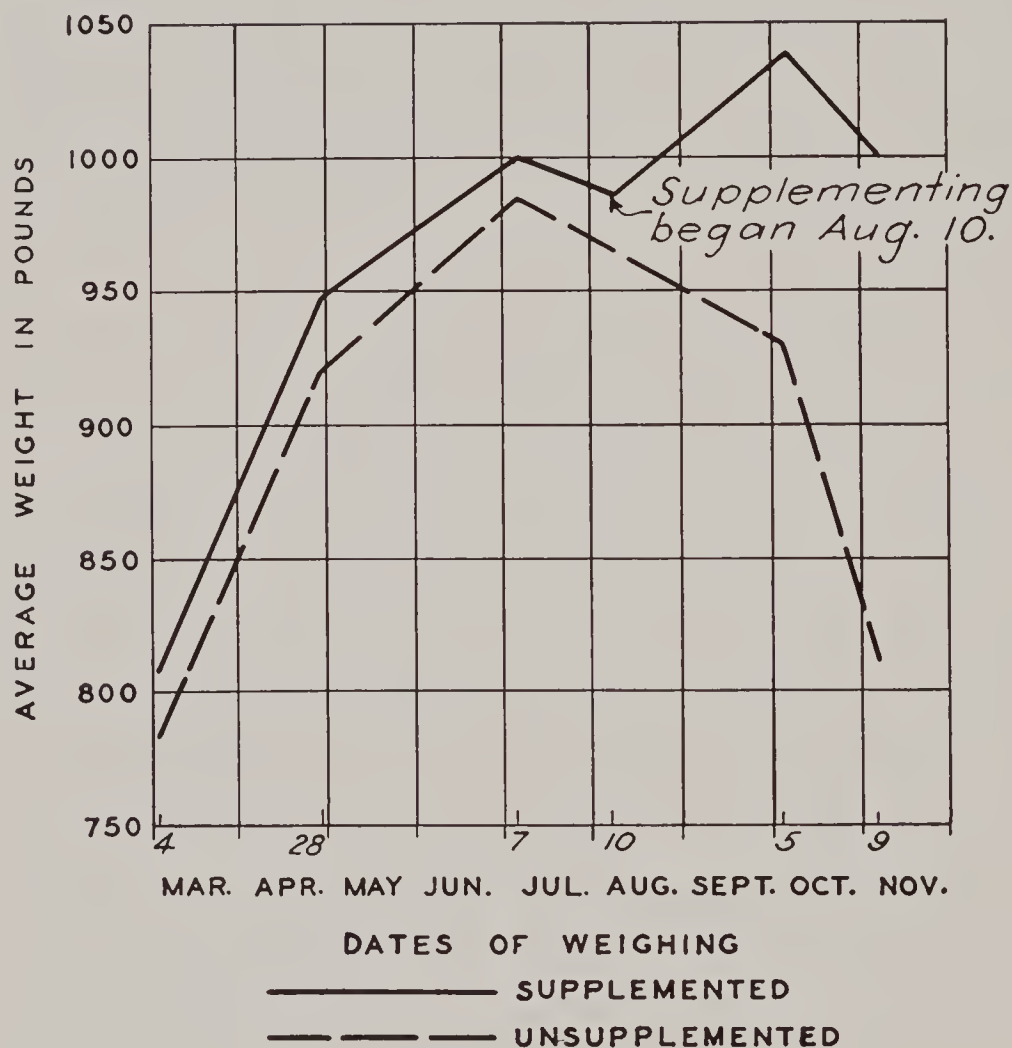


Figure 17.—TRENDS OF WEIGHTS OF SUPPLEMENTED AND UNSUPPLEMENTED COWS ON ANNUAL GRASS PASTURE FROM EARLY SEASON INTO BEGINNING OF CALVING PERIOD 1937 (SAN JOAQUIN EXPERIMENTAL RANGE), FROM DATA IN MANUSCRIPT IN PROCESS OF PUBLICATION, BY K. WAGNON, H. R. GUILBERT AND G. H. HART.

Figure 18 shows that steers gain little weight in July and August and drop off rapidly thereafter.



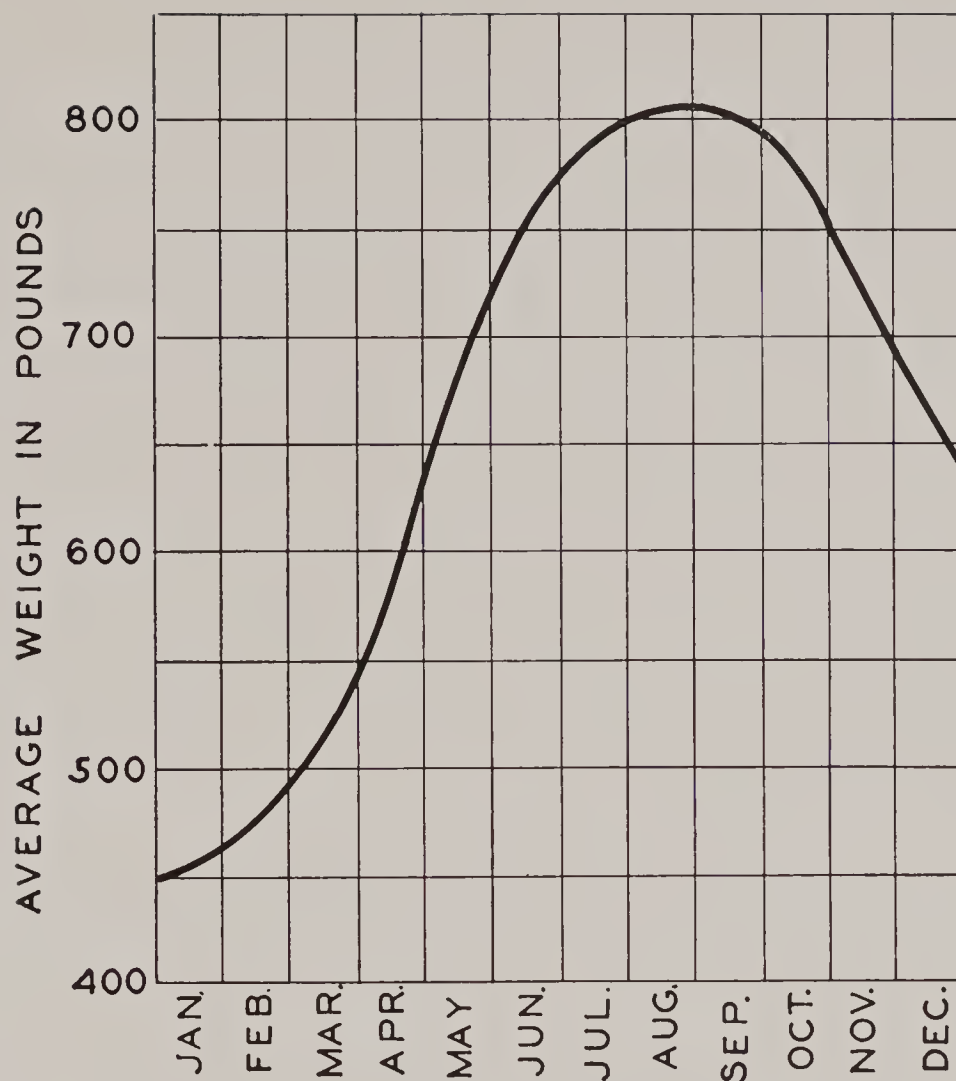


Figure 18.—TREND OF WEIGHTS OF UNSUPPLEMENTED YEARLING STEERS ON ANNUAL GRASS PASTURE. CURVE TYPICAL OF SIERRA FOOTHILL RANCHES (SAN JOAQUIN EXPERIMENTAL RANGE) FROM MANUSCRIPT OF NOVEMBER 1, 1938, BY K. WAGNON, H. R. GUILBERT AND G. H. HART

The job of supplementing can best be handled on the ranch and therefore if more suitable range is not available the livestock should be removed from the national forest.

These examples show that each range type has a characteristic seasonal curve expressing its real value as an economic range which will improve the weight of the cattle. Several of the important range types have not been studied in detail but there is little doubt that they will follow the same pattern.

In one case studied, that of the foothill annual grass range, a calf crop of 90% was obtained when the breeding herd was kept on at least a slight rate of gain by supplemental feeding. In contrast a similar herd in the same area which was unsupplemented and which lost weight produced a calf crop of but 60%. With most breeding herds of range cattle a calf crop of 50% to 60% is the usual rule. This indicates that maintaining the weight of the breeding herd is essential for large calf crops. Studies and observations in other similar areas confirm the conclusion.

#### ECONOMIC FACTORS IN SETTING GRAZING SEASONS FOR CATTLE

There are two basic types of operations among national forest permittees. Type "A" is the group having ranches in the mountain valleys where the feeding of hay is a regular practice. Hay is put up in mid-summer on the meadows, after which, by irrigation, regrowth is secured. A balanced

operation normally requires fall pasturage from around October 1, until perhaps December 1, when feeding starts. This is generally available in part on the public domain and in part from meadow aftermath. A grazing season of four to four and one-half months on national forest ranges fits in reasonably well with other sources of seasonal feed leaving only slightly critical gaps at either end of the national forest season.

Type "B."—On the dependent ranches in the foothills surrounding the Great Valley only small amounts of hay are produced. These are usually used for saddle animals or to tide over during the bad year. Between the close of the latest feasible national forest season and the date when the new green feed is available or high enough to use in the fall, there is typically a substantial gap. This means that dry feed of questionable quality must be "stored" on the home range during the summer to provide for this period of use. This in turn means that livestock must be taken off the home range in the spring while the desired feed for fall use is still growing or by stocking conservatively. There is not normally a material gap between the date of livestock removal from the home ranch to the correct opening date on national forest ranges.

### **GUIDES**

Type "A."—When weight losses start, livestock should be removed to areas where good feed is available either on the low-lying public domain or to the hay meadow aftermath.

Type "B."—By the time weight losses start, the solution of the problem is not to be found in continuing the livestock on the national forest ranges. Equal losses in weight may occur on the home ranges. However, all economic studies indicate the need at this time for supplementing the feed both of meat animals and of breeding herds to obtain desirable weights of such animals at lowest cost and to secure adequate calf crops.

Relatively early closing dates mean most effective use of national forest cattle ranges and may aid greatly in protecting the range.

### **SHEEP RANGES**

From the standpoint of the industry a late closing date for sheep ranges is not of major importance. The lambs have been marketed and there is not the need for special feeds. In fall sheep can secure good use of stubble, fallow fields, fence corners and cropland aftermath and byproducts. These are generally available and adequate. Many operators wish to go to more desirable ranges for bucking.

On the mountain range, with reduced water supplies, trailing is more and more necessary. The new sources of feed that become available in September, lupine, larkspur and western false-hellebore are soon exhausted. The leaves of many of the browse species take on fall colors and drop, and the herbaceous vegetation dries. Use thereafter will concentrate on the small amount of forage of higher quality. The dry sheep will travel more than when the lambs were on the range, resulting in more disturbance to the soil.

*Conclusion:* (1) Check the time when the water supply drops off and trailing between feed and water develops, and (2) when fall colors develop and the remaining forage is dry. Remove sheep then.



## HUMAN RELATIONS

Range management is a joint responsibility of the permittee and forest officer. The success of range management is strongly affected by the degree of respect each of the partners has for the other and by the way in which they work together.

This fact imposes a further responsibility upon the forest officer—that of understanding the man with whom he is doing business, both as an individual and as a member of a colorful and important industry.

The permittee probably grew up with the business. The chances are good that as a boy he worked for and with his father on the range. He absorbed practical knowledge of handling livestock. At the same time, he possibly acquired some practices not now accepted by progressive stockmen. When practices are followed that are not in accord with best usage, an overnight change cannot be expected. Habits of long standing are not broken in such short order.

As the individual grew up with his business he acquired the rugged independence typical of stockmen. His independence resulted from management of his own affairs in a business beset by hazards of weather and the chances of unstable markets. It goes without saying that willingness to take a chance became linked with this independence.

The forest officer deals with a man sure of himself and his judgments and often tenacious of the ideas of range management acquired over a long period. Such a man attaches great importance to experience. Only the unwise will challenge that experience until friendship and mutual understanding and sure knowledge on his part make possible a meeting of minds.

The man of this kind may be expected to dislike or resent:

1. Official authority as such.
2. Quoting the rule book as an answer to his arguments.
3. An attitude of intellectual or educational superiority from an official.
4. Assumption that all of the answers are known.
5. Lack of interest in his business.
6. Parade of being busy.

If the forest officer himself has been brought up in the country or has had ranching experience akin to that of the stockman, he will start with a considerable advantage. The forest officer who is not well versed in the ways of the range should never pretend a knowledge he does not possess. No one is more keenly aware of false pretense than the stockman, particularly if it has to do with things of lifelong familiarity to him. But no one is more generous with advice and suggestion, if the man lacking experience shows a desire to learn.

Failure to listen to advice in the spirit in which it is given will not only deprive the forest officer of the benefit of the other's experience but it will lessen opportunity for cooperation. Courteous acceptance of sound advice paves the way for further suggestion and for partnership.

No rules can be set up here that will insure most effective working relations between permittee and forest officer. All the rules in all the books that have been written on human behavior have a way of breaking down under some circumstances. The only safe bet when misunderstanding arises—and many difficulties do arise from misunderstandings—is to endeavor to get the other fellow's viewpoint. When both permittee and forest officer seek to understand the viewpoint of the other, the way is paved to amicable solution of most difficult issues.

One way to awaken the permittee's active and effective interest in forest work is the forest officer's attitude toward the things and values that are important to the stockman. To a large degree the forest officer gets what he gives.

Time is one thing required to do business with the stockman. This must be recognized. It is part of the job. To show impatience or to cut discussion short is, to him, discourtesy.

None of this means that it is either desirable or necessary to waive rules or good practice. The respect of the permittee can be lost as quickly for weak failure of the forest officer to live up to his code as by the adoption of an official, police-authority attitude. The stockman, too, has his code that deserves recognition and respect—that of fair dealing and standing up to issues.



# GETTING MANAGEMENT OF LIVESTOCK ON RANGE

## RESPONSIBILITIES

### AS A JOINT JOB

To obtain effective and controlled use of the range involves both the operator (the permittee) and the range manager (the ranger). It is a team on a venture in which there is a natural division of responsibility.

The permittee works under a contract—his application, his permit, and his range management plan—and is responsible for so handling his livestock on the range as to carry out its intent. The range manager is responsible for seeing to it that the contract is just, practicable, protects both the range and the operator, and that it is lived up to.

Neither can do without the other. The permittee, for his own guidance, and to hold up his end, needs from the manager:

1. A clear-cut, explicit plan of management, based on practices of proved worth, fitting his particular range, and economically practicable.
2. A clear understanding of his responsibilities for maintenance or construction of range improvements.

If the manager fails to provide these, he in effect gives to the operator a power-of-attorney to make his own management plan and to settle his own responsibilities.

The manager should secure from the permittee his ideas on range management based on the results of his operating experience, as well as the need for additional improvements, etc.

Joint study on the range itself is an indispensable part of the job. Full mutual understanding of exactly what the job is, the division of responsibility, and the working out of the venture can hardly be obtained otherwise.

#### RANGER RESPONSIBILITY TO PERMITTEE

1. Advance notification of numbers allowed for next season.
2. Advance notification of requirements for counting.
3. Notification of earliest date for entry.
4. Discussion and supply of written plan and map required for management on range.
5. Notification requirements for maintenance improvements.
6. Taking initiative to go over range with permittee when inspections are to be made or administrative action planned.
7. Written report on findings and instructions from each range inspection.
8. Written notification of administrative action proposed unless instructions carried out.
9. Prompt action to prevent trespass on permittee's allotment.
10. Supply of current advice on anything that he finds out that will assist permittee or help to reduce losses, such as springs starting to fail, straying of bulls, etc.

## PERMITTEE RESPONSIBILITY TO RANGER

1. Full trial of the plan of management before arguing that it is impractical or impracticable.
2. Prompt and workmanlike keeping up of improvements for which he is responsible.
3. Discussion of parts of plan which after trial prove unworkable.
4. Personal attention to livestock on range, intimate knowledge of range, and effort to go with manager on inspections.
5. Confirmation of counting arrangement and date of entry.
6. Prompt report of any material change in ranch ownership or livestock status.
7. Immediate action to return livestock to range if advised is off allotment.
8. Assistance in preventing and reporting trespass.
9. Full, voluntary assistance in reporting and suppressing forest fires.

## MANAGEMENT TOOLS

### EFFECTIVE PRACTICES IN HANDLING CATTLE ON RANGE

Handling cattle on the range is for the twofold purpose of producing quality and quantity of animals and at the same time to obtain the even utilization necessary to maintain the range. The stockmen should therefore have a range husbandry concept or interest in range maintenance and up-building.

This is indicated by:

1. The amount of attention given to the management of the range by the owner.
2. The ability of his employees to do the job of riding, etc.
3. The satisfactory condition of equipment and facilities on the range.
4. The consistent effort made to control livestock, to salt, to maintain and better the range improvements.
5. The even distribution of livestock particularly by elevational zones.
6. The action in carrying out the features of the plan for the unit.
7. The condition of his livestock at the end of the season.
8. The condition of the range at the end of the season. This is the final measure of management effectiveness.

The Stockman will:

1. Move livestock quietly and avoid "running fat off them."
2. Make little use of his dogs.
3. Not allow livestock to lose weight on closely grazed areas when good feed is available on other parts of his allotment.
4. Not permit his livestock to hang out in poisonous plant areas and will either keep them out entirely or remove them from the area when the feed is only partially utilized.



5. Train his livestock. The good operator teaches his cattle to come when he calls them whether they want salt or not. He drives them to new salt grounds until the animals learn the locations. He teaches them to "stay put." This may mean dogging severely if they insist on using places where they do not belong, and disposes of the old cows which have too strong a "homing instinct" and too good knowledge of the favored areas to be taught new habits of use. Young or strange cattle stay put better than the old-timers. If the permittee really wants good management, he will through persistence secure it under what may appear to be almost impossible conditions.
6. Provide good maintenance of improvements. He will clean out springs and get troughs in order at the beginning of the season; he will see that the water is flowing all season and that the troughs are full of water or else remove livestock to other portions of the range if water sources dry up. He will maintain the fences. He will do light clearing on his trails used for riding his range. In other words, he will take as much interest in his range as in his own ranch.
7. Quietly move the cattle to the gathering pasture without the colorful ceremony of a Fourth of July celebration and then just head them home; the old cows will do the rest.

If it has been the ranger's good fortune to have participated in the round-up, he should be able to say, "The cattle look fine and there is some feed left on all parts of the range."

As a reward to the stockmen the grazing capacity of the ranges will be maintained and above all the livestock will be in better shape as the result of careful handling and being kept on good feed.

#### **EFFECTIVE PRACTICES IN HANDLING SHEEP ON RANGE**

The three factors in the handling of sheep on a range are the management plan, the owner, and the herders.

*The management plan* will provide for the method of feeding or the routes of travel, the poisonous plant situation and the maintenance of improvements. The adherence to the plan will be indicative of the effectiveness of the permittee's management.

*The herder* will aim constantly to secure the best possible weight of lambs. This will result in the least possible overuse and a uniformity in grazing the allotment. It will mean the grazing of the earliest maturing areas first. It will mean the burro system of handling and the observance of the one-night bed rule.

Open herding will be used; "drifting" instead of driving sheep over the feed areas. They will be well spread out, grazing quietly and moving slowly. They will bed on fresh ground each night so they can start out on fresh feed

each morning. The amount of water on the allotment will affect the amount of trailing to and from water. The herder will therefore graze the sheep far from water in the early season when they drink less often and thereby eliminate the need for much trailing later.

If necessary, sheep will be trained to herd and to react to the dogs before entering the forest. As a whip is used to train a horse, so is a dog used with sheep. Severe use of a dog along a fence on the ranch until the sheep understand the dog makes herding easy on the open range. Then the dog need hardly be used. His presence is sufficient to make the sheep amenable. The dog may be stationed to act as a fence or to quietly move sheep or turn them. The "dogging" of sheep, which is to send dogs running and barking to start animals running and bunching, is hard on the sheep and hard on the range.

Probably the best indicator of the ability of the herder is his use of his dogs. Barking dogs, sheep kicking up dust and bunching are clear indications of his incompetence. Lazy herders make excessive use of dogs, will use the open areas only and use bed grounds several nights in succession if allowed to do so.

Sheep prefer to bed down on a bench or ridge top. They prefer to go downhill in the morning and uphill in the evening. However they can be grazed in ways that seem impossible, can be made to feed to a line across broken topography and in a quiet manner so that they are "on the gain" at all times.

Sheep will not be bedded down on damaged or eroding areas nor shaded up along water courses if damage to vegetation results or pollution is a problem.

Sheep will not be allowed to trail back and forth needlessly on contours on steep hillsides, creating terrace-like trails and increasing possibilities of erosion.

Salt should be furnished regularly in sufficient amounts to keep sheep contented. Salting to be done on bed grounds and not on water.

*The owner* will bear his agreed-upon share of the maintenance of the improvements and clean out the debris rolled into trails and roads by his sheep; he will see that a clean camp is kept by his herder and that the antagonism of other forest users is not incurred; he will realize the antipathy of some recreationists to sheep and to the odor of their bed grounds; he will carefully guard against trespass in closed areas and otherwise avoid close use or bedding near areas of recreational use.

The failure in sheep management from the range standpoint is easily recognizable, and less difficult to cure than with cattle. The difficulties come with changing herders and in the poor manager type of owner.



## CORRECT SALTING PRACTICE

The development of effective salting practices is an essential part of any plan of range management. This is particularly important with cattle, since it is probably the most effective tool in the control of this class of livestock. It is also relatively inexpensive. An adequate amount of salt always available and distributed as the studied needs of the range require, has the following effects:

### On the Range

Assists materially in improving its condition through:

1. Retarding *drift* to higher elevational zones until forage is ready.
2. Promoting more even *distribution* of livestock with consequently more even utilization.
3. Securing *utilization* of less accessible forage.
4. Minimizing *damage* from concentrations around water, meadows, etc.

### On the Livestock

Assists definitely in better growth and condition through:

1. Keeping it contented.
2. Improving its ease in handling.
3. Supplying an essential element in diet.
4. Keeping it on better feed.

### When to Salt

Salt should be available on all parts of the ranges at the time livestock is permitted to use them. This helps to "locate" the livestock and to encourage it to stay where it should be, especially if on new ranges.

### Where to Salt

#### Cattle

Salt the range, not the cattle. In other words, it should be placed so it will attract them to where they should be. Good practices in placing salt grounds:

1. Where the available feed is located.
2. In types difficult to get utilized.
3. On slopes that can be grazed.
4. On accessible ridges, knolls, and benches.
5. In openings in browse types.
6. Not closer than  $\frac{1}{4}$  mile from water in easy country;  $\frac{1}{8}$  mile in rough topography, but preferably  $\frac{1}{2}$  to 1 mile distant.
7. In rare cases, near water when:
  - a. Supply is temporary and necessary to draw enough livestock into area served for the short time water is available to utilize the available feed.
  - b. Limited amounts for perhaps the first year when drastic change is being made in the salt distribution plan. It has been naturally as-

sumed that cattle need water after taking salt. If one wishes to disprove this he should take a few grains of salt when thirsty. The reaction generally is more to quench the thirst than to increase it. This does not hold true if salt is combined with food, but livestock allow the salt to be assimilated before feeding. Repeated trials under varying conditions prove that livestock do equally well when salted away from water. By judicious placing of salt, many areas can be fed maximum distances from water that would otherwise remain unfed.

#### Sheep

1. At their bed grounds.

#### Where Not to Salt

#### Cattle

1. In areas of natural livestock concentration, such as around water, in meadows, in the center of areas of high forage production, etc.
2. In overgrazed, eroded or overused areas.
3. In areas too difficult for livestock to reach.
4. In young timber areas.
5. Near recreational centers.
6. Near the boundaries of unfenced ranges.

#### Sheep

1. At water.
2. In meadows.
3. In overgrazed patches.
4. On eroded sites.
5. In areas close to extensive growths of poisonous plants.

#### How Much to Salt

Adjust the amount of salt not only to the number of livestock but also to the amount of forage that can be utilized properly from each salt ground.

The following factors influence as indicated the amount of salt that must be put out on any range for a given number of livestock:

#### Reduce amount put out per head

1. Heavy salt content of feed.
2. Dry condition of feed.
3. Presence of salt in water.
4. Natural salt licks present.

#### Increase amount put out per head

1. Low salt content of feed.
2. Succulence of feed doubles need.
3. Losses from weathering, rain.
4. Use by game.

Cattle as a general rule need around two pounds a month while on largely succulent feed or browse, and one pound per month for the rest of the grazing period.

Sheep need from three to four pounds annually, which can well be given them at the rate of 50 to 75 pounds for 1200 ewes with lambs each three days while on the range.



## **What Kind of Salt**

Several types of salt are available. The kind to use should be left to the permittee's preference. Blocks may be broken or two or more put out so that a number of animals can use them at once. Any type of salt is satisfactory, though care must be taken not to make sufficient quantities of the loose salt available to salt-starved cattle so that injury or death may result.

## **How to Salt Cattle**

After determining the grazing capacity of each unit of available range, make a salting plan that will provide for the needs of the number of livestock that should use the forage crop. Locate salt logs, boxes or containers at each point designated in the plan and require that salt in specified amounts be kept in these. Each location should be definite and be named or numbered.

The container should not be watertight, otherwise collecting rain water will dissolve the salt. The resulting brine is quite dangerous to the animals. In order to get the cattle used to the new set-up, it may be necessary to drive them to the new salt locations a time or two if they do not use them by themselves. Be sure the amount of salt is not so great at any point as to maintain greater numbers of livestock in the area than available forage can support.

## **MANAGEMENT PLANS**

Range management is the handling of livestock on range lands in such a manner that the soil and forage resources are not impaired and so that grazing does not conflict with other uses. Likewise range lands should be so managed that they will contribute to the economic stability of the dependent livestock industry. To accomplish these objectives, effective range management plans must be prepared and applied by the range manager.

Range management plans are based on an analysis of the range resource and the problems affecting its use. They should clearly define the range situation and the problems involved with its use and set down in quantitative terms how the range will be used to achieve the objectives of range management. Plans should be simple, direct, flexible, and easy to apply, and must be maintained and revised to meet changing conditions and adjustments or to conform to more accurate data as they become available. The effectiveness of range management plans is measured in terms of productive ranges and economic livestock operations.

### **The Range Management Plan**

Complete instructions for the preparation of range management plans are contained in the Forest Service Manual. The instructions outline in detail the form in which the plans should be assembled and explain fully their use and application, so discussion herein is limited to a brief outline of the material and data that are contained in a range management plan and how they are presented for the most efficient use.

The ranger district is the unit for which plans are prepared. They are designed so that the more fixed items and long-time phases of planning are separated from the live elements which are subject to frequent changes and

require revision. The plans are arranged in three sections, as follows, so that revision and application can be accomplished with the minimum amount of effort and to make them more readily interpreted and used.

I. Written section (applies to the whole ranger district) :

1. Basic and scientific information about the resource, i.e., grazing capacity, kind of livestock, seasons of use.
2. Statement of condition and needs of local livestock industry, i.e., demand for range, ranching practices, economic factors.
3. Statement of long-time objectives for the management of the resource.
4. Action necessary to attain the objectives, i.e., intensive management, reduction programs, range improvements.

II. Graphic section (consists of composite maps and overlays covering the whole ranger district) :

1. Base map for entire ranger district showing permanent resource data, such as grazing types, topography, water, and cultural features.
2. Overlays for base map showing management data :
  - a. Grazing capacity, showing acreage, and capacity figures by land subdivisions and management units.
  - b. Range improvement features, showing fences, water developments, salt grounds, etc.
3. Tables summarizing resource and management data.

III. Field application section (prepared for each individual range allotment in the ranger district) :

1. Ranger Field Plan

- a. Individual allotment map showing range management data and used as a reference for inspecting the range.
- b. Overlay—Transparent sheet with allotment boundaries traced on it, placed over the allotment map for recording inspection data—new overlay used annually—serves as inspection report.
- c. Allotment inspection sheet—Form to be used as field record of permitted livestock and current plan of use—also to record actual use data as collected.

2. Permittee Plan

- a. Map of allotment showing how the range is to be used, issued to permittee by ranger.
- b. Specific written or tabulated instructions to permittee from ranger, of things to be done by the permittee.



Figure 19 illustrates the whole procedure of range management planning and shows how the different sections of the plan integrate and function together to keep it a live and usable record to accomplish effective management of the range resource.

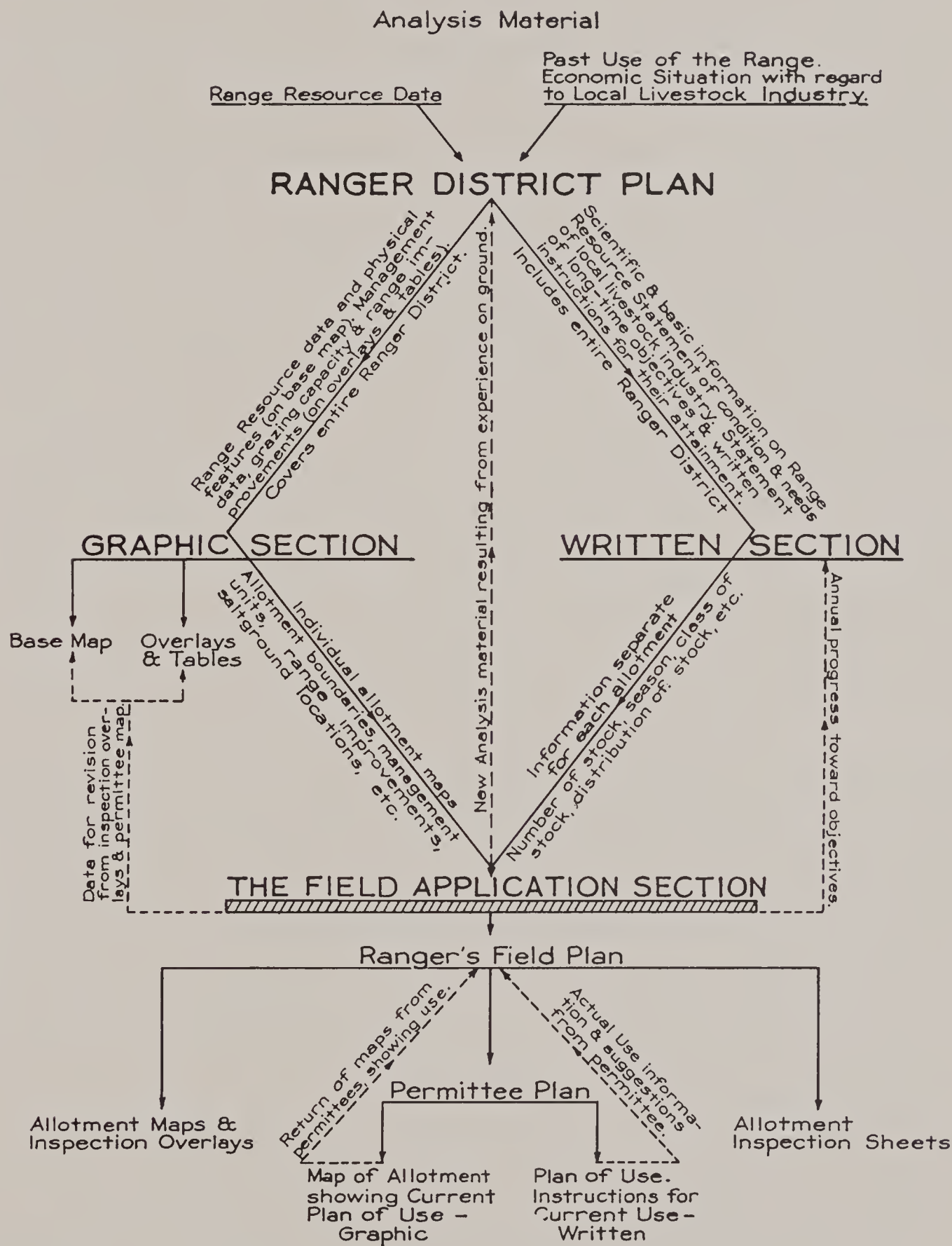



Figure 19.—GRAPHIC SUMMARIZATION OF RANGE MANAGEMENT PLANNING

Samples of the Ranger's Field Plan for a cattle range and sheep range are presented to demonstrate the use of the plan for range inspection.

(Sample of Allotment Inspection Form)

CATTLE RANGE INSPECTION FORM

Year 1939 Ranger District Milford  
Name of Allotment Fitch Canyon  
Name of Inspector Ben Beard  
Name of Permittee Arthur J. Stowall  
Name of Manager or Rider Jim Stickley  
Marks & Brands Lazy bar S (S) on right hip 

Permit Data									
	Permitted				Actual Use				Trespass:
	: On	: Free	:	:	: On	: Free	:	:	:
	: Paid	: &	Pvt. :Exempt:	:	: Paid	: &	Pvt. :Exempt:	:	:
	: Off	: Land	:	:	: Off	: Land	:	:	:
No. Stock	: 30	: -	: 90	: -	: 30	: -	: 90	: -	: 5
Animal Mos.	: 1140	: -	: 360	: -	: 1155	: -	: 360	: -	: 1
Period	: 4/1-5/31:	-	: 6/1-9/30:	-	: 4/1-5/31:	-	: 6/1-10/4:	-	: 6/25-6/30:

Plan of Use									
Management or	Planned				Actual				:
Distribution	Distribution				Distribution				Salt Plan
Unit	:No.Stock:	Period	:No.Stock:	Period	:Log No.:	Period	:Lbs.Salt	:	:
Spring range	: 30	: 4/1-5/31:	: 30	: 4/1-5/31:	: 1 + 2	: 4/1-5/31:	: 60* each	:	:
	:	:	:	:	: 3, 4, 5	:	: 50* each	:	:
Summer "	: 360	: 6/1-9/30:	: 355	: 6/1-10/4:	: 7, 8, 10	: 6/1-7/31:	: 30* "	:	:
	:	:	:	:	: 6, 9, 12, 13	:	:	:	:
	:	:	:	:	: 14, 15, 16, 17	: 8/1-9/30:	: 120* each	:	:
	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:

Losses during season:

Predators — Disease 1 Poison 2 Unknown 1 - Auto Killed

Sales:

Long yearling  
Kind of stock Steers Number 80 Average Wgt. 950 Price per lb. 7 1/4



## Supplemental Inspection Notes

### Fitch Canyon Cattle Allotment - Milford District - 1939

6/29 - Rode from station up stock trail to Raker cabin. Stock trail needs some maintenance work, mainly brushing out and fixing creek crossings. (Estimate 3 man days work)  
Rodent control needed in meadows around Rakers. Contact Stowall next spring and get him to put out poison.

Erosion in meadows along Cottonwood creek serious, control structures needed and area should be fenced to prevent heavy use. See if land owner and permittee can work out some cooperative deal to get the work done.

Unused area north of Fitch cabin has early feed, annual grass and weeds. Have permittee move salt log from Fitch cabin to new location up the cañon and push stock into this area during early part of the season.

Located site for new salt log on ridge south of Cottonwood creek to get better use of the feed in the area.

Notify Raeph Mitchell of trespass stock and the condition of the fence around his field.

9/15 - Rode west portion of allotment in company with Jim Stickley, rider for Stowall.

Looked over spring on Stony Ridge in section 4. Not enough feed in vicinity of the spring to warrant development.

Meadows in Cottonwood creek overused, they are the natural congregating place for cattle. Fencing is necessary to prevent damage.

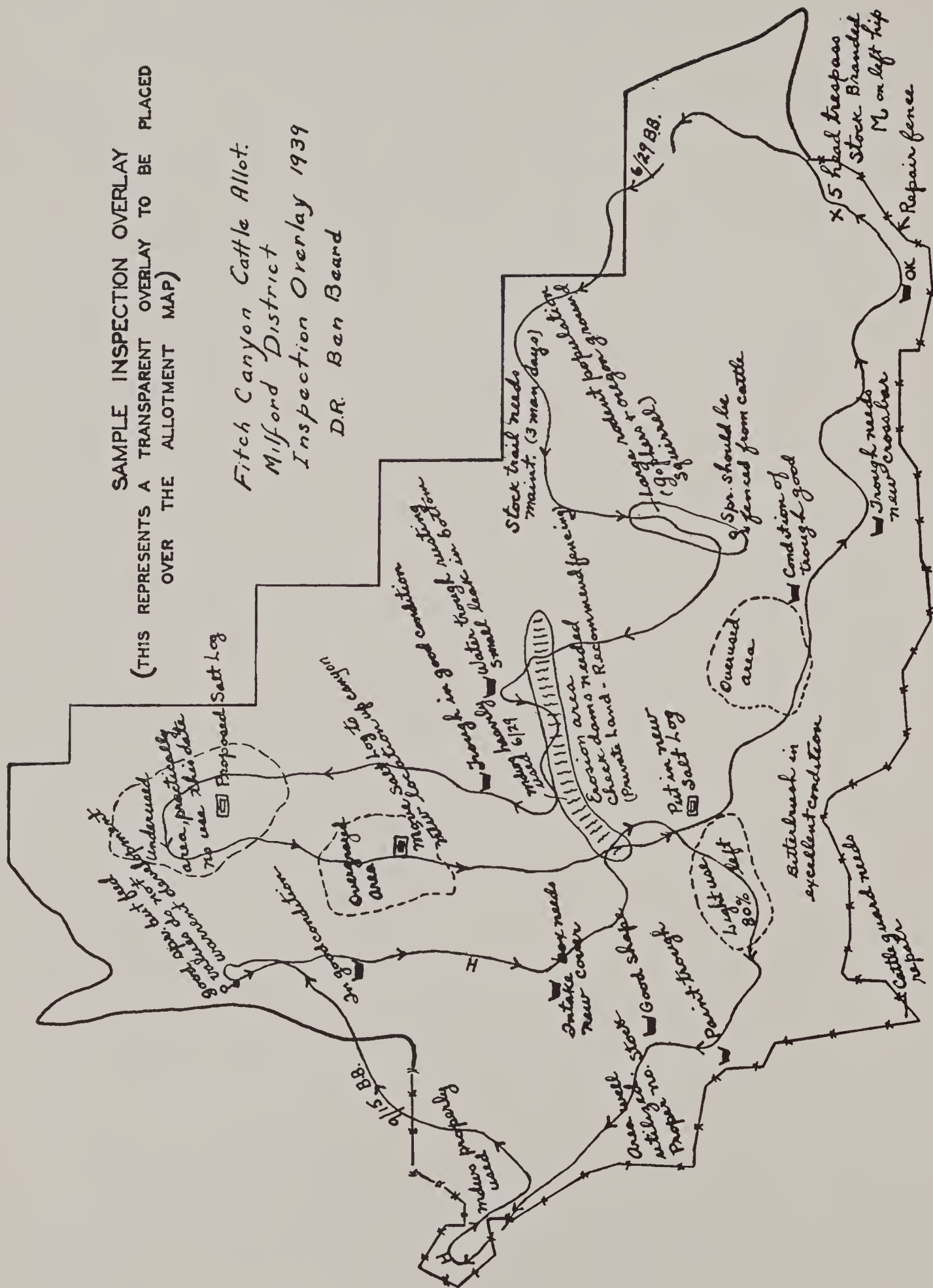
Light use on slope south of Cottonwood cr. Addition of new salt log will probably secure better utilization. Showed Stickley location for new salt log.

Portion of allotment west of Stony Ridge the use is about proper (70%). Meadows in pastures showed proper use. Used as a beef pasture for 40 head.

Cattle guard on Last Chance road needs 3 new rails.

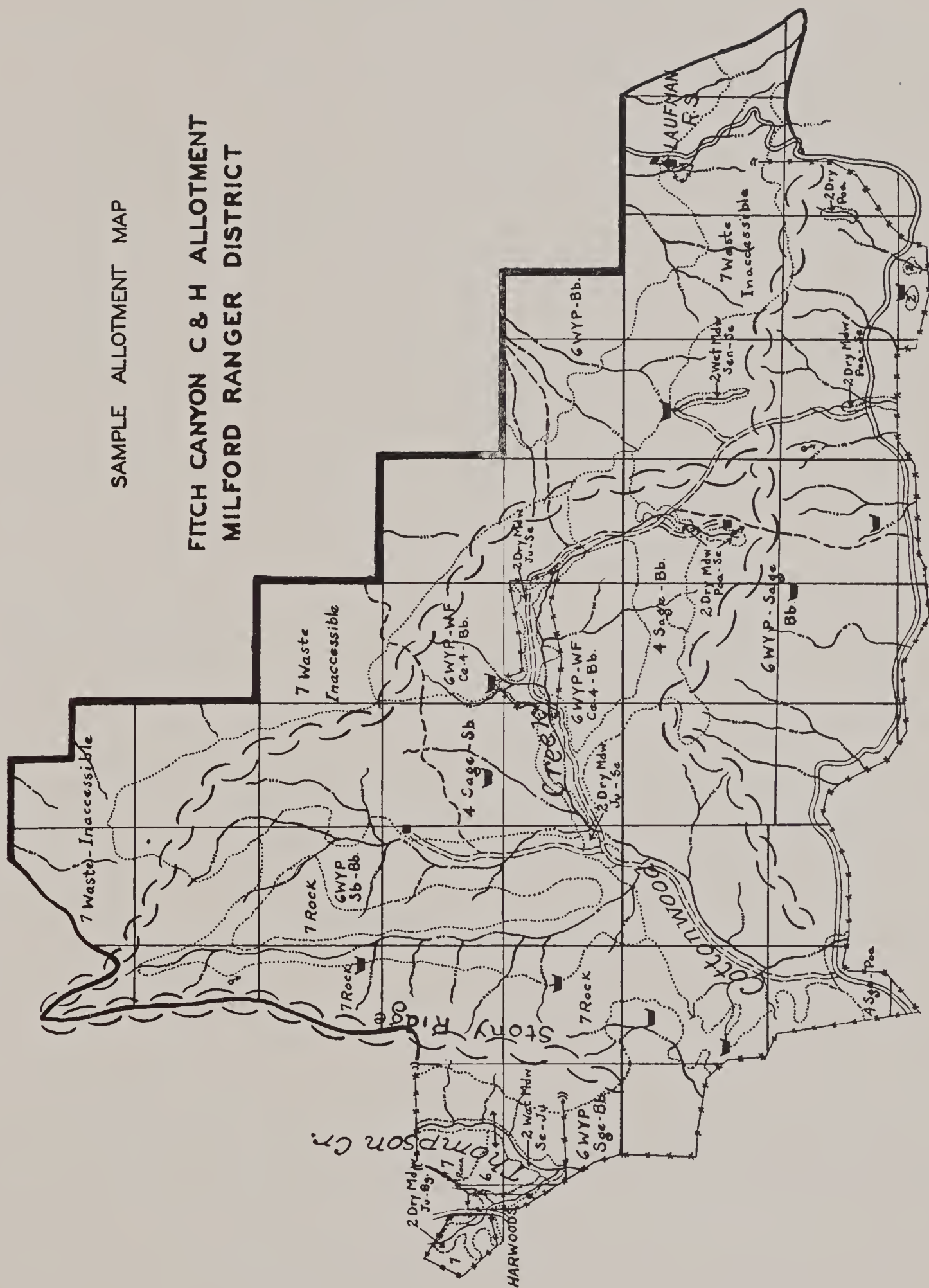
SAMPLE INSPECTION OVERLAY  
(THIS REPRESENTS A TRANSPARENT OVERLAY TO BE PLACED  
OVER THE ALLOTMENT MAP)

Fitch Canyon Cattle Allot.  
Milford District  
Inspection Overlay 1939  
D.R. Ben Beard





**FITCH CANYON C & H ALLOTMENT  
MILFORD RANGER DISTRICT**



(Sample)

## Annual Instructions to Permittee

Fitch Canyon C & H Allotment—1940  
Arthur J. Stowall—Permittee.

### Distribution

Better distribution of the cattle on the sage and pine areas north of Cottonwood Creek, should be secured during the early part of the season from June 1 to July 15 to get more use of the early feed. More riding will be necessary to keep the livestock pushed out on these areas away from the meadows.

Move salt log from Fitch cabin to the new location at head of the canyon marked with your rider Jim Stickley last season. The location for a new salt log on the ridge south of Cottonwood Meadows was marked with Stickley last year, which will secure better distribution in this area.

The beef pasture west of Stony Ridge should be stocked at 40 head the same as last season as utilization was proper in that area at the close of the season.

### Salting

Salting should be done the same as last season in accordance with the salt plan posted in the rider's cabin. Salt should be placed in the new log south of Cottonwood Meadow beginning July 15 and kept full until September 15.

### Improvements

Your rider will be furnished 100 lbs. of poison grain to put out in the meadow at the Raker cabin prior to the time the stock goes on the range.

The spring at Raker cabin should be fenced before the cattle get in this area, with the poles your rider got out last summer.

The drift fence at the east end of the allotment will require some maintenance this spring by your rider.

All watering troughs will be checked this spring by our maintenance crew and put in condition for the season.

### Fire Cooperation

I wish to express my appreciation for the cooperation and assistance given by your rider last season in suppressing fires and contacting hunters, and know I can expect the same cooperation for the coming year.



(Sample of Allotment Inspection Form)

SHEEP RANGE INSPECTION FORM

Year 1939 Ranger District Milford  
Name of Allotment Willow Creek  
Name of Inspector Ben Beard  
Name of Permittee Samuel J. White  
Name of Camptender Jose Valero Name of Herder Pete Hernandez  
Marks & Brands Black open circle (G) on left ribs

Permit Data									
	Permitted					Actual Use			Trespass:
	On	Free				On	Free		
	Paid	&	Pvt.	Exempt	Paid	&	Pvt.	Exempt	
	Off	Land			Off	Land			
No. Stock	1068	-	132	44	1084	-	132	44	-
Animal Mos.	4272	-	528	16	4300	-	510	16	
Period	6/1-9/30		6/1-9/30	6/1-9/30	6/1-9/26	-	6/1-9/26	6/1-9/26	

Plan of Use for Current Season				
Name Camp Unit	Order of Use	Days Planned	Days Used	
East	1 <sup>st</sup> 6/1 - 7/1	30	30 - 6/1 - 7/1	
West	2 <sup>nd</sup> 7/1 - 9/15	77	74 - 7/1 - 9/12	
East	3 <sup>rd</sup> 9/15 - 9/30	15	14 - 9/12 - 9/26	

Losses during season:

Predators 4 Disease — Poison 1 Unknown 2

Sales:

Kind of stock Lambs Number 1210 Average Wgt. 71 Price per lb. 6 1/2

Wool - Number lbs. 12,000\* Price per lb. 2 1/2

# SAMPLE INSPECTION OVERLAY

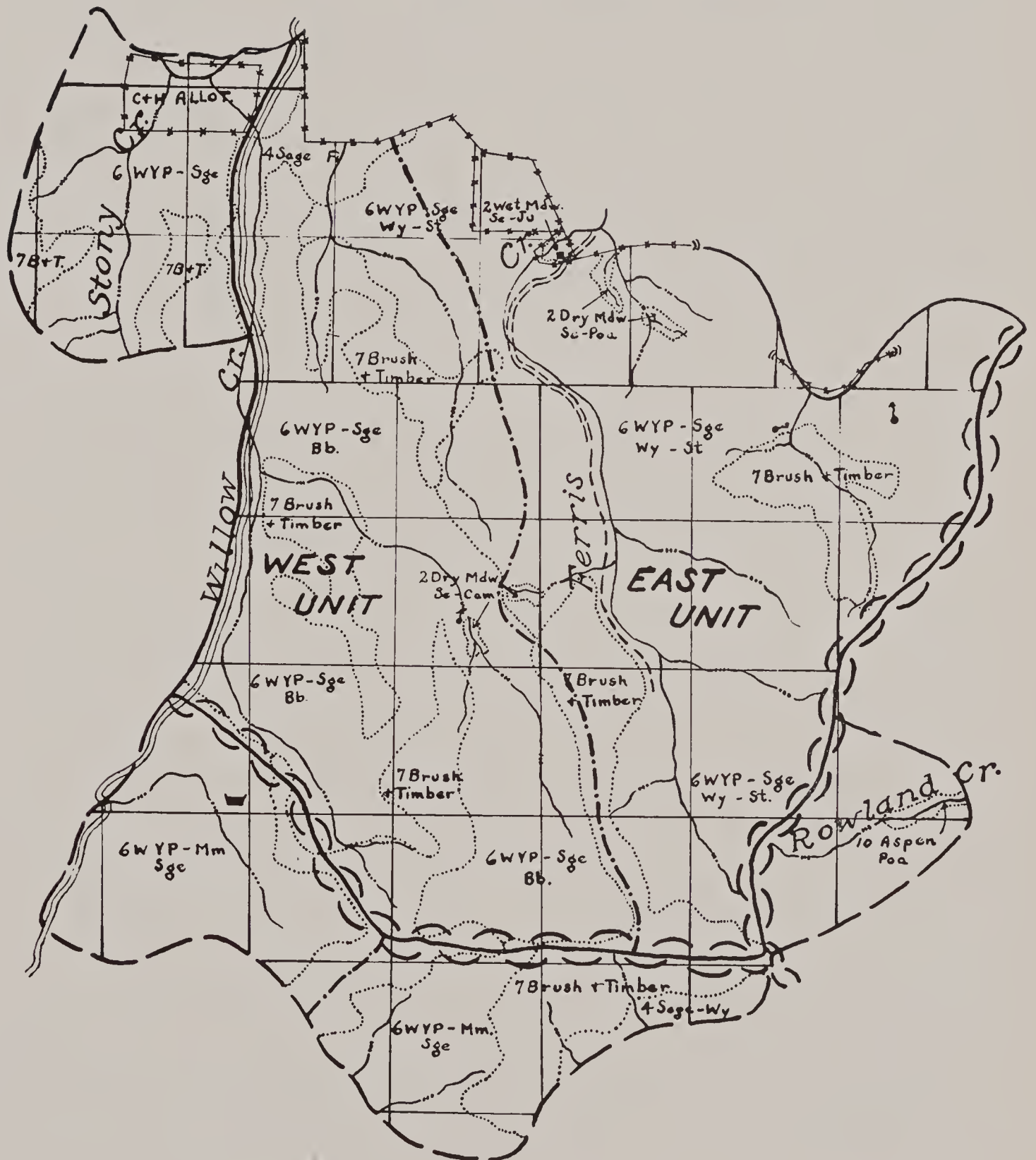
(THIS REPRESENTS A TRANSPARENT OVERLAY TO BE PLACED OVER THE ALLOTMENT MAP)





# SAMPLE ALLOTMENT MAP

## WILLOW CREEK S & G ALLOTMENT MILFORD RANGER DISTRICT



## Supplemental Inspection Notes

Willow Creek Sheep Allotment - Milford District - 1939

7/21 Inspected portion of Willow Creek sheep range with Jose Valero, camp tender for Sam White.

Found six head Will Ritchie's stock in trespass. Notify his rider to remove stock and repair the fence.

Spring in sec. 4. needs a set of watering troughs for water storage. Make G-16 project for next year.

Trailing damage in Rowland Creek unavoidable, only place herder can get sheep into water, but trips to water should be limited.

Instructed camp tender to have herder discontinue use of bedground in saddle between Ross Canyon and Rowland Creek, some erosion getting started.

Sheep got over allotment boundary in Ross Canyon. Trespass was innocent, misunderstanding on location of boundary. Recommend the boundary be established permanently here so it can be posted. Valero was shown the correct lines so he could instruct the herder.

Bedground in East fork of Willow Creek too close to meadow and creek, warned camp tender to discontinue its use. Advise White in instructions in 1940.

Too heavy use around camp tenders hq's, herder kept sheep on the area 4 days, only 2 days feed at the most.

8/25 - Hiked over part of Willow Cr range in Stony Creek

Utilization in the area 10% just about proper use for this time of season.

Damage along Willow Creek on the driveway is improving since forced sheep to stay above the road when driving through

9/30 Hiked from Willow Cr. Summit down creek to camp-ground.

No damage by sheep in cut over timber south of the summit. Area was grazed light about 50% utilization

Lots of deer sign observed in the refuge, but no evidence of overuse by deer. Those deer seen were in good condition.

Utilization on this portion of the range considered about proper at close of the season. About 80%.



(Sample)

## Annual Instructions to Permittee

Willow Creek S & G Allotment—1940

Sam White—Permittee.

### Distribution

The west unit of the allotment will be grazed first, from June 1 to July 1. One trip should be made over the unit, grazing it lightly during the period. The east unit will be grazed from July 1 to August 15 and the remainder of the season the herder should clean up the feed on the west unit.

Last season your herder, through a misunderstanding of the allotment boundary, trespassed four days in the head of Ross Canyon. Jose Valero was shown the correct boundary and an effort will be made this season to post the lines prior to the time the sheep are in this area.

The area west of your headquarters at the Ferris cabins was grazed too heavily last year because the herder kept the sheep there four days. Since there is only about two days' feed in the area, Valero was advised to have the herder stay only one night and move the sheep after two days' grazing.

### Bedding

All bedgrounds inspected last season were left in good condition by your herder, but use of the bedground in the saddle between Ross Canyon and Rowland Creek should be discontinued as some erosion is starting in the area. Also the bedground near the meadow in the east fork of Willow Creek should not be used as it is too near the meadow and creek. The bedground near headquarters should be used one night only.

### Watering

Some trailing damage is occurring in Rowland Creek where the sheep are driven into water, which is unavoidable, but watering at this location should be limited to as few trips as necessary.

A set of troughs will be installed at the spring in section 4 during the early part of the season, as we arranged with you last fall. Your camp-tender will be contacted when the construction material is ready to be packed to the location.

### Care with Fire

Your herder last season was very careful with his camp fires, but he was suspected of starting a fire, which occurred on your allotment, by smoking. You should see that your herders and camp-tenders are fully aware of their responsibility with regard to fire.

# **RANGE INSPECTION**

The processes of determining and analyzing the facts about range condition and use are range inspection.

The range manager has a multitude of conditions to analyze, many threads of a tangled mass of observations to unravel, a complicated mess of: season to use, amount of use, kind of use, and method of use, to segregate into cause and effect and work out of it an accurate prescription of use.

## **THE DIFFICULTIES—LACK OF PERSPECTIVE— LACK OF SYSTEMATIC RANGE HISTORY**

A single range inspection, however thorough, is a single point in a continuing process of range use. It lacks perspective. Evidence on the ground, accurately diagnosed, may give full answers to the numerous and difficult questions facing the range manager. However, whether the range is improving, deteriorating or maintaining itself; whether the current forage year was better or poorer than average; whether stocking is correct or otherwise; can only be fully answered if seen against the entire recorded history of the range. Managers who have lived with a range for years, and who thus carry in their heads its history, have a great advantage over men assuming responsibility for ranges new to them.

Current range inspections are thus an investment for future use, as well as a regular part of the present job of management.

## **PURPOSES, KINDS AND USES OF RANGE INSPECTION**

### **PURPOSES**

Range inspections are made to appraise the condition of soil, vegetation, livestock, improvements, and use, and to determine the effectiveness of management by the administrator and the contractual compliance by the permittee.

Thorough and systematic inspection during a season, and continuing season after season, bring to light necessity for corrective measures. Unless such measures are taken promptly and decisively, the effectiveness of the inspectional effort is lessened or lost.

The casual or intermittent inspection cannot furnish the backward look that will afford basis for comparison with the present and therefore a forecast of the future. It merely pictures the present without perspective.

Effective inspection involves records, graphic and written. Records of each inspection should tell a story. The story, however complete in itself as a portrayal of conditions at the time the inspection is made, is but a chapter in the history of the allotment. Carrying forward an uninterrupted history of each allotment is a necessity, for without such a record, intelligent administration is difficult at best, and when the gaps are too frequent, impossible.



## KINDS

Inspection for the grazing year involves four steps.

1. Examination of range to determine when stock should be permitted to enter the forest. See "Setting Opening Dates," page 110.

2. Livestock counts.

Half the cattle and sheep herds counted annually, unless special conditions require fewer or additional counts, tends to insure compliance with permitted numbers. Seeing cattle as they enter the forest affords basis of comparison of condition later in the season. Although condition of livestock alone is not a safe indicator of range conditions, it is one of several factors to consider.

3. Early inspection.

This is a thorough appraisal of conditions after a brief period of use. The forest officer and the permittee or his responsible representative should make this a joint inspection. Management provisions are to be reviewed, the summer's job of handling planned, and, where necessary, remedial measures taken. Without this, a year will be lost in obtaining betterment.

4. Fall inspection.

This in effect is a follow-up of the early inspection. Again it is desirable to be accompanied by the permittee or his representative. This inspection serves also as a check upon the grazing capacity and brings to light conditions of range and livestock, affording opportunity for correction of failures or errors in management.

5. Home ranch inspection.

A step, not necessarily to be taken annually, is an inspection of the permittee's home ranch, inclusive of any off-forest range owned or leased. The purpose of this is to determine commensurability, to discuss matters of mutual interest, and possibly to make livestock counts. Such trips have a number of values, that of public relations not the least. See Appendix 2, "Commensurability Surveys."

## USES

The first four steps outlined above, consistently followed each year, will bring to light:

1. How far to go in stocking, by throwing into relief the exceptionally good years and the extremely bad ones.

2. The dates for opening and closing seasons best adapted to good forage crops.

3. The use of the range that will insure uniform and correct utilization.

4. The need for improvements necessary to secure No. 3.

5. A mutual understanding between permittee and forest officer, conducive to the best interests of the former and the progressive administrations of the latter.

## HOW TO INSPECT

### WORKING WITH PERMITTEE

The importance of working closely with the permittee cannot be too strongly urged. The best possible relationship between forest officer and permittee comes from joint inspection. Out of such inspections the counsel of the permittee is secured, as well as immediate action to better management or to remedy bad situations. Even though immediate action is taken with his representative, rider or herder, the permittee should be informed in writing of any failures in management and possibly of any suggestions for improvement in plan or operation.

The only fair assumption to make is that the permittee is as much interested in good management of his allotment as is the forest officer. On this assumption the permittee should have his copy of the management plan, specifying clearly his responsibilities, and written memoranda resulting from the findings of range inspection.

### THE TECHNIQUE OF SAMPLING

The utilization standards contain statements, based on long experience, regarding the key points in the several range types where damage is most likely to occur. The inspector, in planning his route of travel, will of course pay particular attention to such points. Because of great differences in the way in which sheep and cattle use a particular type of range, he will of course look for different key points, depending on the kind of livestock involved.

Determining whether damage is occurring is, however, only a part of the inspection job. The route of travel should cover as well the areas on which forage is likely to be unutilized or only partly used. Here again the kind of area to look at will be different on cattle and on sheep ranges.

Ordinarily a planned route of travel which samples thoroughly the spots or areas on which to look for overuse and underuse will carry the inspector through the parts of the range having average or full utilization.

Specific attention should be given to checking on salting.

The inspector necessarily looks ahead to the action program which may result from his inspection and in which he will be the motivating force. Thus his inspection needs to be thorough enough so he can, with full confidence, discuss his findings with the permittee. There is, of course, no simple rule to set an exact definition of how thorough is thorough enough. On a range of uniform type, less travel per thousand acres is required than on a range having a crazy-quilt pattern of range types. Similarly, an inspector already thoroughly familiar with a range can sample it with less coverage than can a man inspecting it for the first time.

As a general guide the inspector, whether previously familiar or unfamiliar with the range, has to prepare himself so that he can discuss with assurance the major parts of the range.



## KINDS OF INFORMATION TO RECORD

Thorough range inspection involves observing and recording systematically many kinds of information. The major classes include:

What is happening to the soil.

What is happening to the vegetation.

Whether there are material losses of livestock from poisoning.

The character and quality of handling livestock on the range.

The condition of range improvements and the need for additional improvements.

The prevalence of wildlife.

Whether game is a factor in the use of the range.

## TYPICAL SITUATIONS

Situations encountered on undivided range units, and the process of inspection, are given in the following examples.

### **An Extreme Situation — A Badly Depleted Range**

After considerable difficulty, a forest officer was able to get one of his permittees, who held a permit for 125 head of cattle, up to the allotment for a joint inspection in midseason. As they rode up the meadow from the range headquarters, the stockman stated he had been trying to get up ever since the cattle were turned out, to put out some salt, but had been too busy.

The range consisted of a long drainage with moderate slopes and a live stream running through the open canyon bottom the entire length of the allotment. There was a series of meadows along the stream containing approximately 25% of the grazing capacity, but the bulk of the forage was on the slopes.

In the first meadow the forest officer found erosion in early and advanced stages, both sheet and gully. Creek banks were breaking down. A swirl of wind carried a cloud of dust that showed where the topsoil had gone. Rising above the pebbled surface were widely scattered clumps of turf and an occasional hummock topped by a sickly-appearing growth of closely cropped grass that indicated change from wet meadow to dry meadow and now to an almost barren flat. In the third meadow deep gullies were cutting down through the flat. These if viewed from above would have appeared as the veins of a leaf. Behind every log laying at right angles to the lower slopes, silt had filled in flush with the top. There were but few vestiges of good forage plants remaining near the water course but up the slopes there was evidence of good feed.

A large bunch of cattle were out on the flat and an examination of the ground where they were collected showed that at times in the past a rocky outcropping had been used for salting. The appearance of the cattle was in keeping with the general appearance of the range.

They crossed the flat and quartered up the sidehill. The evidence of grazing soon decreased. On a small bench about three-fourths of a mile above the flat they came to a half-rotted log that had once had a section hollowed

out to contain salt. Lack of old dung heaps showed that no livestock had been in the vicinity for a number of years. Dead grass under the present season's growth further indicated no use of that portion of the allotment for several years.

There was evidence however of livestock having once been on this portion of the allotment as far back as the summit of the ridge and a good mile from the flat below, the nearest water.

A day's ride visiting key areas on the allotment indicated the same conditions. In nearly every instance livestock were congregated on flats that had once produced good meadow feed. What salting had been done was on the flats. No use was being made of salt logs and boxes that had once been located at strategic points to secure distribution of livestock. At two different seeps, rusty pipe and rotted troughs showed where, under happier circumstances, water had been developed for small bunches of cattle. Although it was not possible for a cow to get a drink, there was indication of sufficient seepage to justify development again. Every evidence pointed to failure and to lack of any form of management.

*Action:* The ranger and permittee discussed and agreed upon the failure in management and the handling and salting that were required to protect the range. They stayed over a second day and located the salt grounds and the permittee agreed to place salt on the range during the next week. The ranger prepared a pencil memorandum, and gave a copy to the permittee, outlining the management requirements, and advised him such stipulations would be incorporated in his grazing permit the next year. The rehabilitation of the water development was discussed and a cooperative job worked out. Finally on separating they set a tentative date for a later inspection to check on the effectiveness of the plan outlined.

### **An Overgrazed Allotment on the Mend**

The new permittee and the ranger met at the upper end of a meadow. After greeting they rode slowly across the flat to where several gullies had been cutting back up through the meadow. In each instance the head of the gully had been plugged with rock. After agreeing that the crew had done a good job they followed the main arroyo downstream to where several check dams and other gully-head plugs have been installed the previous year. In numerous places banks had stopped breaking and some growth already appearing indicated stabilization of soil.

The permittee told of his efforts to keep the cattle off the meadows and his plan to hire a rider to assist him in the management of his livestock. After traversing the length of the meadow they headed back up a side canyon, driving before them a small bunch of cattle that had gathered on the lower end. After traveling some 400 yards they stopped and allowed the livestock to join another small bunch that were feeding on the sidehill. Quartering up the slope they came to a little flat on which a salt box had been installed. On a nearby tree was the saltground sign. Some discussion was had as to the best time during the year the group of saltgrounds of which this was one should be salted.



The next place visited, about one-fourth mile on, was where a seep had been developed that would provide for some 12 or 15 head. Here they examined the ranger's map on which was portrayed similar seeps not yet developed, and made tentative plans for future development. The scheme was not in the interest of providing for more livestock on the range but with the idea of drawing and keeping cattle off the meadows, to permit regaining the lost water tables and forage growing capacity.

The two men followed up the ridge, discussing ways and means of enticing cattle up higher to the feed still not utilized. After a couple of miles they sat down, and with the meadows down below in sight planned a salting scheme that would bring the cattle up to the divide from both sides. Then on down again along a stringer to the big meadow on the south. It was pleasing to the ranger to find cattle well up on the slopes; to see another water development, crude but effective, and indicative of the cattleman's effort; and salting grounds that were fulfilling their purpose.

After they gained the level and started down the meadow there were further evidences of what nature would do if given a chance. While it would be a long time before there could be a return of the original growth, the three years that had passed since the original efforts to stop erosion and keep livestock from the flats were already showing results.

The banks of the main cuts has sloughed down until the side slopes were in repose, and already growth on slope and bottom was well under way.

So for two days the men threaded the allotment. As with salting, riding and starting on water development, the new user had put in shape the fences of the holding pasture which had been allowed to become dilapidated by the man he bought out three years previously.

At the end of the trip the permittee and ranger were in full accord and had mapped out a simple plan of management that would mean eventual dollars to the former and successful administration for the latter.

### **A Satisfactory Range Situation**

The forest officer after close observation decides that no disturbance of soil is occurring. As injury may be occurring to the cover, and as yet no damage to soil, he gives the same close examination to forage as to soil.

His judgment that no injury is being done to the plant growth is borne out by the excellent distribution of livestock throughout the allotment. This distribution is evidenced by the presence of salt on the appropriate salt-grounds, a uniform utilization of feed, and no heavy concentration of cattle at any one place.

He is justified in assuming that the permittee is meeting in full the requirements of the allotment plan of handling.

The final step of estimating the sufficiency of feed for the remainder of the season assured the permittee and forest officer that the grazing capacity of the allotment is in agreement with the number of livestock permitted.

## **DIAGNOSIS OF THE DETAILED FINDINGS**

In analyzing the mass of detailed information obtained through inspection, the manager needs to hold in mind the types of decisions which he will make as a basis for action.

First of all, is the range as a whole, or separate parts of it, improving, maintaining itself, or deteriorating? Here the notes he has taken should be checked against the utilization standards. The key facts, particularly as to condition of soil and vegetation, will, as thus cross-checked, lead to clear-cut conclusions as to the present conditions and, in most cases, as to whether the trend is in the right or wrong direction. This process is the indispensable first step.

Second, if all or parts of the range show defects, indicating the need for action, it is necessary to carry the analysis to the point of deciding what are the causes of the unsatisfactory condition. Clearly this group of decisions is required so that the action program may go after the real causes.

### **TYPICAL EXAMPLES OF BASIS FOR DECISION AS TO CAUSES OF DEFECTS FOUND ON INSPECTION**

1. Too early opening date is involved if :
  - a. Evidence of heavy trampling.
  - b. Range use before specified growth stages of indicator plants reached.
2. Too heavy stocking is involved if :
  - a. Heavy utilization major part of range, either midseason or end of season.
  - b. Normally unpalatable species eaten.
  - c. Poor condition of livestock in midseason or late season.
  - d. No seeding plants left.
  - e. Cover removed from areas subject to erosion, hence hastening processes.
3. Poor management is involved if :
  - a. Parts of range overused, parts underused or unused.
  - b. Range improvements not kept up.
  - c. Salting carelessly done or not done.
  - d. Livestock poorly distributed.
  - e. Evidence of improper herding or bedding practices.
  - f. Undisposed of carcasses.
  - g. Excessive losses from poisonous plants.
  - h. Excessive damage to patches of reproduction.
  - i. Erosible areas heavily grazed.
  - j. Sheep getting in domestic water or bothering campers.
4. Too late closing date is involved if :
  - a. Range is badly trampled in soft places.
  - b. Livestock normally goes off in midst of heavy fall storms.



- c. All of forage is eaten.
  - d. Livestock is gaunt when leaving range.
  - e. Sheep are hard to handle.
5. Wrong kind of livestock is involved if :
- a. Portions of feed such as meadows are badly overutilized in ranges 35% and up of this type.
  - b. Excessive amounts of palatable weeds are found on a cow range with shortage of grasses and palatable browse.
  - c. Considerable palatable forage is left at distance from water.
  - d. Many small springs abound in areas of under- or unutilized feed on a sheep range which are susceptible to development for small numbers of cattle.
  - e. Cattle are running wild through many colonies of special-use permittees and campgrounds too scattered and extensive to fence.
  - f. Much palatable forage found unused in rough mountain pockets.

## **ACTION ON INSPECTION FINDINGS**

### **Problem 1:**

What should be done where inspections disclose conditions of overutilization of range allotment of all forage types?

#### *Conditions*

The ranger covered the range completely on his fall inspection, accompanied by the permittee. This merely confirmed the findings on his earlier visit that year that in spite of the fact that the permittee was following the practices outlined in the management plan in good shape and was running the number of livestock permitted, and while the forage conditions were determined to be a little better than average, the range was actually overstocked. Furthermore the cattle were not in good shape. Checks on the number of deer on the range showed this to be not in excess of the normal stocking. The heavy use by cattle on this range had been noted by inspections during former years and the adoption of improved handling measures recommended had not materially improved conditions.

#### *Action*

The ranger discussed the conditions with the permittee. They reached an amicable agreement that something else had to be done in the interest of both the range and the livestock. The only answer appeared to be a reduction in permitted number on the allotment, since the same relative condition obtained during several grazing seasons. The ranger told the permittee that he would have to recommend a reduction of 20% for the next year in permitted numbers on the allotment but that an effort would be made to take care of the balance of his preference on some adjacent range, though the permittee should make his plans to meet ultimate removal if this had to come.

### *Why*

Range problems such as this should be settled by mutual field discussion between permittees and forest officers whenever possible after a full, fair, joint field evaluation of conditions. Prompt action should be taken to remedy situations needing this, with earliest possible notice given to permittees where adjustments are involved, so they can protect themselves. In fairness to permittees, every effort should be made to take care of established users on national forest ranges.

### *Supplemental*

Obviously range inspection will uncover many types of things that need to be done in better range management other than to make reductions. Definite agreements, confirmed in writing by the forest officer, as to what, how and when each job will be done, should be reached, so that there will be no possible misunderstanding. The interests of both the range and permittees should be given full consideration in arriving at any needed decisions.

### **Problem 2:**

What administrative action is required when permittee fails to put salt on a series of saltgrounds in accordance with a recognized and understood plan?

#### *Conditions*

Forest officer discovers considerable concentration of livestock on a meadow. Investigates, knowing that something is wrong to bring so many head together. Finds blocks of salt had been dropped in a number of places from car or truck along edges of meadows. Salting in this manner is not in line with the allotment plan, copy of which is in hands of permittee.

Rides up sidehill and spends several hours checking on salt boxes. Discovers none have been in use and that feed near the saltgrounds is unutilized while meadows are being overused.

#### *Action*

Permittee required to move salt from edges of meadows to saltgrounds ; to move livestock from meadows to areas unutilized near saltgrounds. Cattle herded back from meadows until accustomed to new environment. Ranger checks within a week for compliance.

### *Why*

Failure to follow requirements of salting prescribed in management plan was resulting in range damage.

### **Problem 3:**

What should be done when permittee fails to keep in repair the range improvements assigned to him for maintenance in the management plan?

#### *Conditions*

The forest officer in the course of inspection discovers that a stock-



watering place vital to the use of one-fourth of the allotment is in bad repair. Under the plan of management the permittee agrees to keep the project maintained to full capacity. Pipe had not been drained the previous winter and in consequence burst. Troughs were dry and the overflow from the spring had been running over the ground. Trampling had turned this into a bog which made it almost impossible for cattle to drink.

#### *Action*

Permittee notified of condition and of necessity for immediate repair. Verbal statement followed up by letter outlining the situation and necessity for immediate action. Copy of letter to supervisor.

Follow up on ground within prescribed time when work would be started.

#### *Why*

Permittee careless and dilatory—evidenced by failure to drain pipes previous fall and to check water at beginning of season.

Letter and copy to supervisor to record situation as basis for possible drastic action in event of failure to make repair within reasonable time.

Situation required prompt restoration of water as other sections of allotment would have to carry livestock until repairs made.

#### **Problem 4:**

What should be done where one permittee allows part of his cattle to drop out and remain on the range of another across which he was driving?

#### *Conditions*

Forest officer was notified by one permittee that another permittee had allowed cattle to drop out of his herd while crossing the latter's allotment onto his own. Investigation on the ground brought out that owner had successively dropped three or four head while on his regularly permitted route across the other range until some forty head were slowly feeding up country to their own allotment but on the other area. Forty head were actually taken to their allotment though the other forty would eventually arrive there but would in the meantime be grazing on range not allotted to them.

#### *Action*

The forest officer immediately sought the trespassing permittee and had him return to pick up the cattle dropped along the way. Informed him that no evidence of sore feet or leg weariness justified dropping cows along the line.

Wrote him also of the incident to make record for some possible future use. Sent copy of the letter to the supervisor.

#### *Why*

The failure of the permittee to live up to the terms of his permit re-

sulted in loss of feed to another permittee and to overuse of the latter's allotment.

### **Problem 5:**

What should be done with respect to cattle belonging on one allotment found on one adjoining?

#### *Action*

Notify permittee owning trespassing livestock of situation and necessity for immediate removal. Suggest he inform the permittee using range upon which cattle are trespassing when he intends removing them.

Notify the permittee on whose allotment livestock are trespassing of action already taken.

Follow up within week to determine whether situation remedied.

#### *Why*

To prevent misunderstanding and give permittee on trespassed allotment an opportunity to be present when livestock are gathered to satisfy himself that his own cattle are not being worked over unnecessarily.

### **Problem 6:**

What is the proper course of action on livestock found trespassing in the national forest?

#### *Conditions*

Permittee and forest officer making range inspection find a small number cattle not under permit on a range which is fenced along the forest boundary.

#### *Action*

Determine point of entry on forest range; make record of numbers by brands and earmarks; determine ownership.

Gather trespass livestock in sight, drive to boundary. Follow tracks to where cattle entered. Put livestock through fence and determine how break occurred. Tree had fallen over fence. Repair fence. Return with permittee and look for more trespassing cattle.

A number of others found scattered over allotment. Notify owner to do the gathering. Unfair to request permittee to do this. Decision up to him to work with owner in gathering and removal.

Forest officer determines outside livestock numbering twenty head have been on forest range about two days judging from appearance of tracks at break in fence and distance some had drifted from point of entry. Apparently forty cow days involved. Permittee not incensed. His viewpoint similar to owner of outside livestock that notifying owner of situation was neighborly act only, that livestock inside could just as well have gone out.

Forest officer decides nothing in the situation to justify trespass action—promptness in removal of excess livestock and repair of fence only action required.



### *Why*

Trespass action should be taken only where material damage is sustained by the national forest in the absence of intent.

### **Problem 7:**

What should be done to relieve the range from damage which is caused by incorrect range management?

### *Conditions*

The management plan which has been in effect for some years for the range in question requires the burro system of herding sheep and states definitely that no bedgrounds shall be used for more than one night. On inspection by the ranger and permittee it is found that the new herder has been violating the rule quite consistently. As a result some of the range is getting badly used in rather limited areas.

### *Action*

Instructions are issued immediately to the owner by the ranger to correct the practice with the very definite understanding that if the new herder does not change his habits he must be replaced. Follow-up by the ranger is taken within ten days to see what is happening.

### *Why*

All of the provisions of the management plan have a definite purpose and failure to observe any of them is cause for concern and correction. There was a distinct lack of instruction to the herders by the permittee. The importance of this is not to be overlooked.

### **POINTS DEVELOPED BY PROBLEMS**

1. Management plans are developed on the basis of the best available knowledge of qualified forest officers but where, after fair trial, they are found to be in error the facts should be faced and prompt remedial action taken. Problem 1.
2. Where permittees fail to live up to the requirements of their range management plans they should be brought diplomatically to account and compliance should be insisted upon. Problems 2, 3 and 7.
3. Livestock shall not be allowed to remain on range where it is not permitted, regardless of how it arrives there. Problems 4 and 5.
4. Trespassing livestock should be removed promptly by the owner from national forest range and where damage ensues to such range, trespass action should be brought against the owner. Problem 6.
5. Where the range is damaged through failure to handle livestock in accordance with the management plan positive steps should be taken promptly to correct action. Problem 7.

## CASES IN WHICH LAND ACQUISITION NEEDED TO SOLVE PROBLEMS

Such problems are common. Where they exist, affirmative action is indicated.

### **Problem 1:**

When privately owned meadows on a cow range are eroding and control work is planned by the Forest Service.

#### *Conditions*

A cow range on which the dominant forage is in meadows has badly eroded water courses. Many areas are being drained and a marked reduction in grazing capacity is taking place. Some silting of reservoirs lower down is reported and control work is planned for range rehabilitation and control of silt. The major portion of the work would be on private land owned by the permittees. The permittee is either not sufficiently interested or financially unable to do the work.

#### *Action*

Acquire all parcels of land upon which control work is to be done before initiation of the control work.

#### *Supplemental*

Weeks Law and Clarke-McNary money can be used only for the purchase of lands principally valuable for timber production. This case could be handled only as a land exchange unless the meadow areas were an incidental part of a timber case.

#### *Why*

Erosion control work is justified on private lands to a limited extent for demonstration purposes only.

### **Problem 2:**

When land ownership prevents a change to more dependent kind of livestock.

#### *Conditions*

A sheepman owns all of the water holes on an allotment which is equally adapted to cattle. There is a heavy local demand and need for cattle range. The sheep come from the Central Valley where there are other uses for ranch property than sheep raising and other summer feeds for sheep. The possibilities of developing additional water consist of two small springs suitable for cattle only.

#### *Action*

Acquire the land if at right price. Give occupant adequate time to adjust his operation and change to cattle.



### **Problem 3:**

Private ownership and control of key areas of range results in use by a kind of livestock that interferes with concentrated recreational use.

#### *Conditions*

Some small meadows near a recreation development are owned by a cattle permittee. The range is somewhat less adapted to sheep but the recent development of heavy recreational use is resulting in serious conflicts between cattle and the recreational users. The development is in a long canyon stringer, fencing is not practicable, and any closure would necessitate including nearly all of the allotment and making its further use by cattle uneconomic.

#### *Action*

Acquire land under appropriate procedure and stock fairly lightly with sheep. Close to grazing the area occupied by recreationists and a buffer zone around it.

### **Problem 4:**

Ranges owned by lumber company in a commercial timber zone used by a permittee not fully dependent.

#### *Conditions*

A cow range in the mixed conifer type is occupied by a prior use permittee, whose home ranch is in the Central Valley. The range is 60% private land partly cut over and partly virgin timber. The permittee rents this and is issued a permit for 120 head of cattle under a private land permit in addition to a paid permit for 80 head. The land owner does not consult the Service in the selection of lessors on this or other properties. He has offered the land in exchange and the offered prices justify an examination. The range is badly needed to round out unbalanced set-ups of naturally dependent operators in the foothill winter range area.

#### *Action*

Acquire land under exchange procedure. Reservations of grazing rights or stipulations in the agreement or deed should be discouraged. Notify present user his permit will be cancelled.

### **Problem 5:**

When there is need to reserve winter forage for game.

#### *Conditions*

In the Sierra foothills is an area along the forest boundary 20% government land and the remainder private range land both inside and outside the forest. The belt is narrow and represents all of the area a deer herd can use in winter. In summer this herd occupies an area of national forest about ten times as large as its winter range. The winter range is all grazed by both livestock and deer and is fully util-

ized by January 1 in the average year. It is desirable to maintain the deer herd at about its present size but there is a serious threat of heavy losses in the next hard winter and the reduction in grazing capacity is continuing because of the heavy stocking and dual use. The private owner cannot obtain full use of his own property.

#### *Action*

1. Eliminate use of government owned range by domestic livestock.
2. Encourage land owner to adjust use of his lands to a point where grazing capacity will be maintained.
3. Seek legislation (if necessary) clearing way for acquisition outside of national forest boundary.
4. Acquire land under exchange procedure.
5. Adjust use by domestic livestock to extent necessary to obtain improvement in forage stand.

#### **POINTS DEVELOPED BY PROBLEMS**

1. Private land which has high forage raising value but is badly eroded should be acquired before work to restore it is commenced. Problem 1.
2. Where the use of range by the kind of livestock to which it is fitted is prevented because of the private ownership of key controls such as water holes, the difficulty should be cleared up by public acquisition of the limiting factors. Problem 2.
3. Interference among different kinds of use caused through private land complications should be eliminated through acquisition of the troublesome areas. Problem 3.
4. Where private land is needed to round out national forest range units it should be secured by exchange. Problem 4.
5. Land needed for winter deer range is in private ownership. It should be acquired. Problem 5.



# RANGE IMPROVEMENTS

## HOW TO APPRAISE THE NEED AND DETERMINE RESPONSIBILITIES FOR RANGE IMPROVEMENTS

There are three types of management facilities. The first is the rider or herder; the latter two are improvements, those for the actual handling of livestock on the range and those for the convenience of the permittee.

Convenience improvements include cabins, headquarters corrals, holding corrals, horse pastures, gathering pastures, scales and sorting chutes, under special use permits which are the responsibility of the permittee to build. Government participation in the construction of such convenience improvements ordinarily is not justified. On community ranges the government may assist in the construction of holding corrals, gathering pastures, and loading chutes. Improvements for the actual handling of livestock on the range may be built at government expense.

If in the nature of a salting problem government cooperation in the construction of salt boxes or other containers appears desirable, such projects may be approved.

Where livestock can be handled satisfactorily by riding, a question might arise if it would not be more economical to fence. From the stockman's standpoint fencing might be particularly desirable because of losses in weight from excessive driving. As far as the stockman is concerned decision can be reached simply by weighing the cost and benefits of one system against the other.

Where satisfactory distribution cannot be secured by riding, the problem may be one of reaching a decision as to whether to reduce the livestock to the number that will graze the unit without damage or to go to the expense of constructing needed improvements. This cannot always be decided on the basis of cost per head of livestock involved.

Where intensive management is required the investment in fences may be well above any "rule of thumb" figure used as a guide in limiting expenditures. This could be justified only where the needs of a community for summer range cannot be met otherwise.

Maintenance costs of fencing are high. Due consideration should therefore be given this item in planning projects, for in many cases projects will not be feasible from the government standpoint unless permittees will agree to maintain them.

Through the extensive use of electric fencing, if this proves to be of Region-wide application, fencing costs may be reduced to less than one-third of the standard costs and thereby make many projects feasible that are now out of the question.

Serious need for range and the requirement for intensive management justify high investments in water development.

The further development of highways and of trucking will simplify the

problem of driveway construction in some respects but the increased traffic, the increased speeds and resulting danger to public safety from livestock, and the injurious effects of hard surfaced roads on the livestock itself, each make separate driveways almost an absolute requirement unless trucking is resorted to.

Investments for poisonous plant control can be measured against the average annual losses of livestock.

The average investment in range improvements for all cattle ranges on California forests is \$2.00 per head of livestock grazed. Applying the total investment only to those ranges which the improvements affect, the figure would be nearly \$5.00 per head. As a general guide the investment on a single allotment should not exceed \$10.00 per head or the equivalent of ten years' grazing receipts.

## **POLICIES**

Range improvements on national forest ranges should further one or more of the following purposes:

- a. Better distribution of livestock.
- b. Better utilization of ranges.
- c. Betterment of forage conditions.
- d. Prevention or repair of damage to ranges.
- e. More economical control of livestock on the ranges.

To get the most for the investment, improvements will be built only on carefully prepared plans with the definite intention of making them (1) permanent in character, (2) most useful in design, and (3) economical to maintain.

In the case of structures that cannot be moved, they should be installed only where their usefulness for a time long enough to amortize the investment has been determined to be in line with the plan of management set up for the range.

In view of the present shortage of appropriated funds for new construction of range improvements, each forest should go as far as it can under Regulation 9 in securing additional essential structures.

Remember that the best installed and located project is effective only if it is in operating condition whenever it is needed.

Pending determination of the practicability of the electric fence for national forest conditions, no large project using the standard type of fence will be started.

## **NATIVE MATERIALS**

Because of the lack of durability of most of the native timber species, other than post material, it is not desirable to use native materials for other than temporary structures. Exceptions to this include erosion control structures, pole holding corrals, and structures for protection around water supply sources or over unburied pipes, where the best local species of material can be installed and replaced within a few years at low cost.



## KIND OF IMPROVEMENTS

### EROSION CONTROL

The work outlined is designed to:

- a. Save the soil.
- b. Restore water tables.
- c. Allow vegetation to recapture an area.
- d. Reduce or prevent damage to downstream improvements.

Since much mountain meadow land now in a damaged condition is privately owned, the following policy will be pursued in connection therewith:

1. In most cases, acquire by land exchange all such key tracts needing attention, before initiating control projects.
2. Build control structures on private land only after written agreements with owners:
  - a. In limited amounts as demonstrations to create interest in similar measures.
  - b. On immediately adjacent and limited areas when private land control is an essential part of national forest land protection.

The following principles will be kept in mind in planning erosion control work:

1. Structures should be installed on the basis of a thorough appreciation of the runoff conditions to be expected from the drainage areas. Technical engineering advice should be sought where the drainage area exceeds five or six square miles, or to be more specific according to location, wherever it exceeds the following:

Upper Pit and Eastern Sierra.....	5 sq. mi.
Central Valley, Northern Coast Range, and Klamath	3 sq. mi.
Western slopes of Sierras and Coast Range south of Monterey.....	2 sq. mi.
Southern California south of Tehachapi Mountains....	0.5 sq. mi.
2. Study the area thoroughly, see what nature has done, and plan on a realistic basis of natural expectancy.
3. The finer the material to be controlled, the more impervious and tight must be the dams. Coarse material can be stopped with loose types of structures.
4. Use native materials wherever available to expedite the work and reduce the costs which are always heavy for intensively treated areas.
5. Protect all structures from damage, by eliminating grazing entirely for the time, by fencing the area, by changing the kind of livestock from cattle to sheep which can be herded, or by fencing the gullies to be treated. It is good practice to do necessary fencing one or two years before doing control work.
6. Heavy maintenance should be expected the first year after construction, but this should decrease thereafter. Its importance in ultimate success of the work cannot be overemphasized.

No effort will be made here to discuss possible correction of conditions through improved management of range livestock, need for rodent control, or seeding possibilities. The usual types of work on forest ranges will include only gully-head plugs, check dams, channel control, and planting, plus fencing or other means to control livestock use.

### Gullies

The theory of gully control involves :

1. Slowing down the velocity of water so it will drop part of its silt load.
2. Control dropping water so that no further cutting results.
3. Artificial and natural revegetation.

As the velocity of water increases, the ability to cut and to carry silt increases. The finer the soil particles, the more easily they are moved by water. Fine clay soils will seldom stabilize on a gradient of over  $\frac{1}{2}$  of 1%. Fine sand over 1% gravel will stabilize on gradients of 4% where there is a small volume of water. Material once dislodged from its original position will continue downstream until a flatter gradient is found. To achieve sedimentation the velocities must be less than the values given for corresponding materials.

Fine Clay .....	0.25 ft. per second
Fine Sand .....	0.5 ft. per second
Fine Gravel .....	1.0 ft. per second
Coarse Gravel .....	3.0 ft. per second

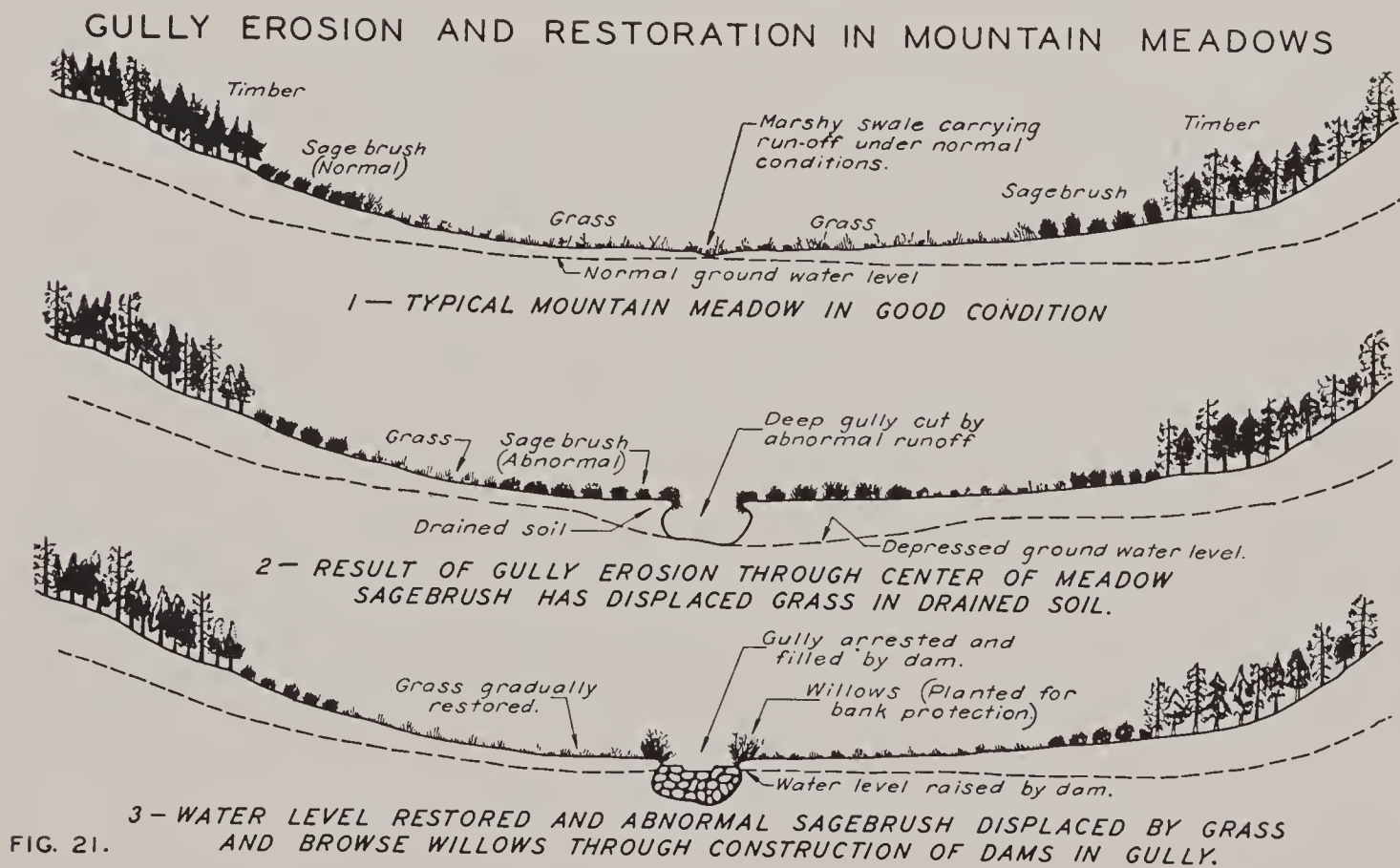
Figures 20, 21, 22 and 23 show the stages of gully erosion and simple control measures.





Photo No. K-1055 Kraebel 6-21-33

Figure 20.—A TYPICAL MOUNTAIN MEADOW, THE PRESERVATION OF SUCH AREAS IS OF PRIME IMPORTANCE IN MAINTAINING A SUMMER FORAGE FOR LIVESTOCK





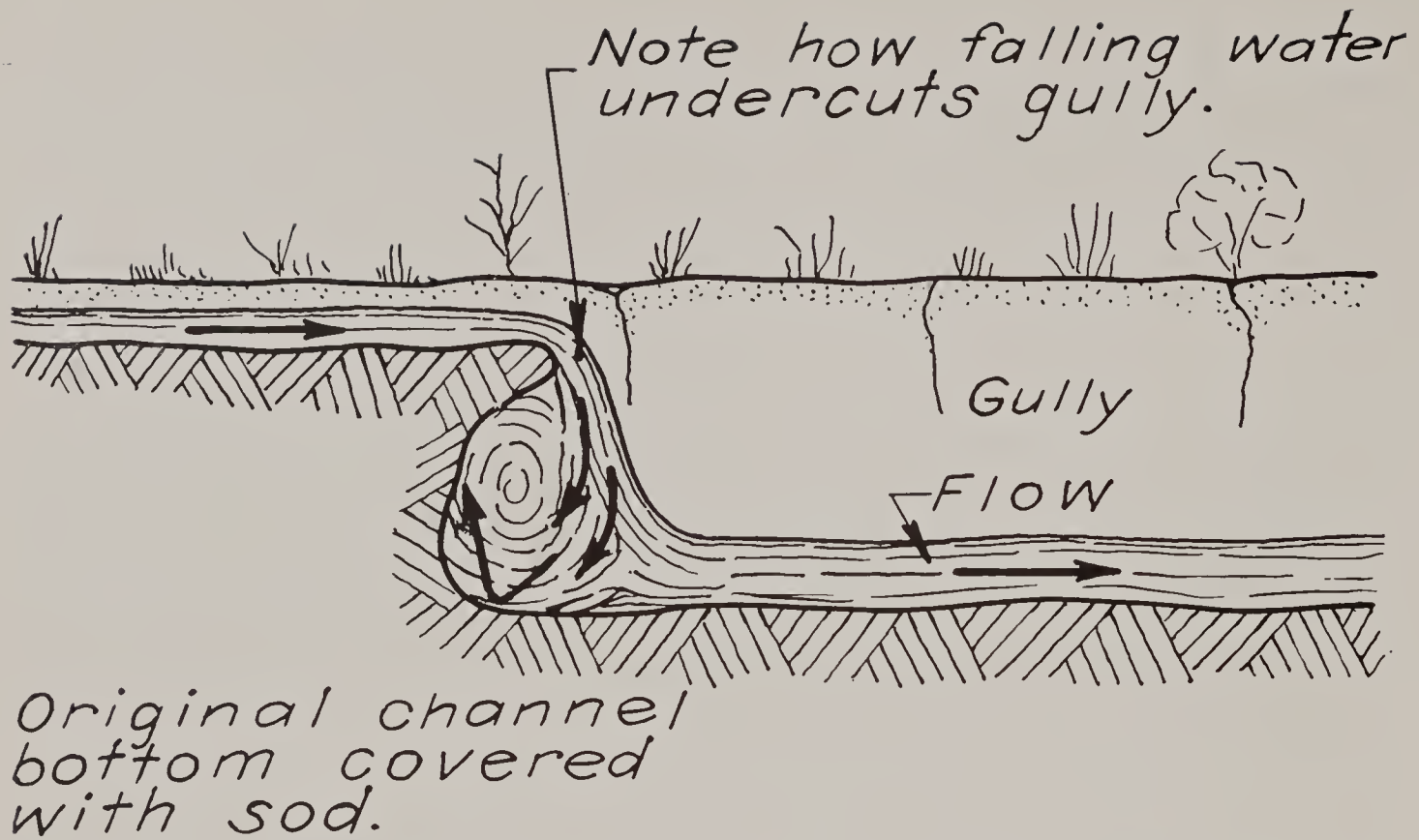


Figure 22.—SIDE SECTION OF A GULLY-HEAD SHOWING THE PROCESS OF UNDERCUTTING



Photo No. 283990 Pillsbury 8-17-33

Figure 23.—AN ACTIVE GULLY-HEAD THAT HAS BEEN CONTROLLED WITH A BRUSH AND ROCK GULLY-HEAD PLUG AND A CHECK DAM

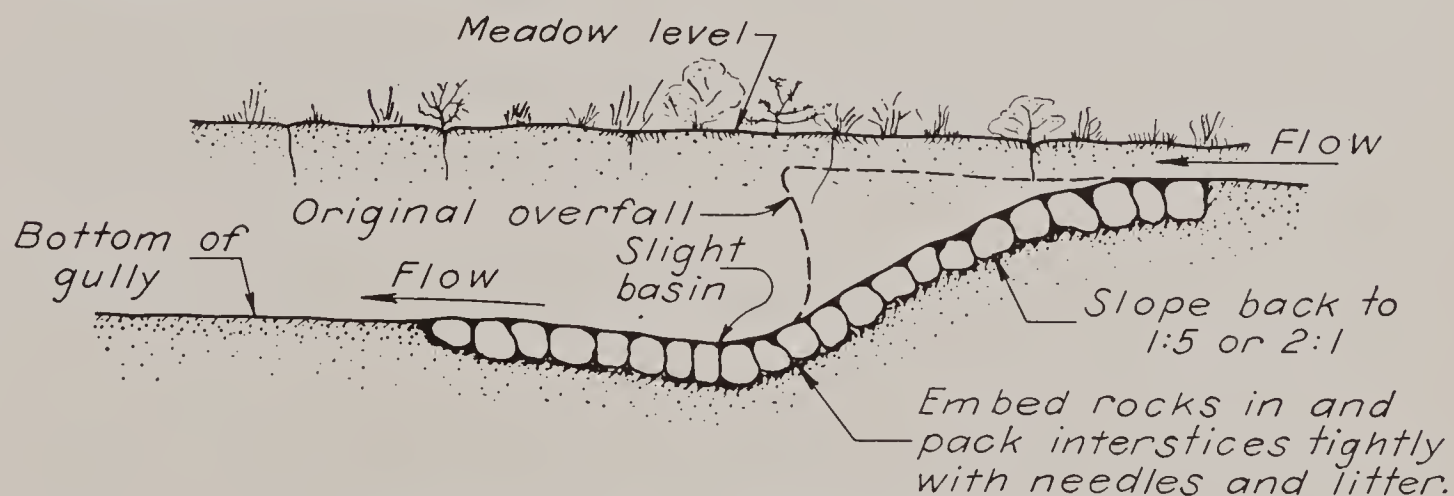


The major damage to valuable mountain meadows starts with a gully working up the stream. In the early stages these can be controlled by the construction of a simple gully-head plug followed by the building of a check dam a few yards below the plug to form a catchment basin which should fill with sediment in a few years, thereby eliminating or decreasing the height of fall of water. The next step is to plant suitable vegetation, such as willows, to give them protection from livestock damage while the recovering process is going on. The different steps will be described.

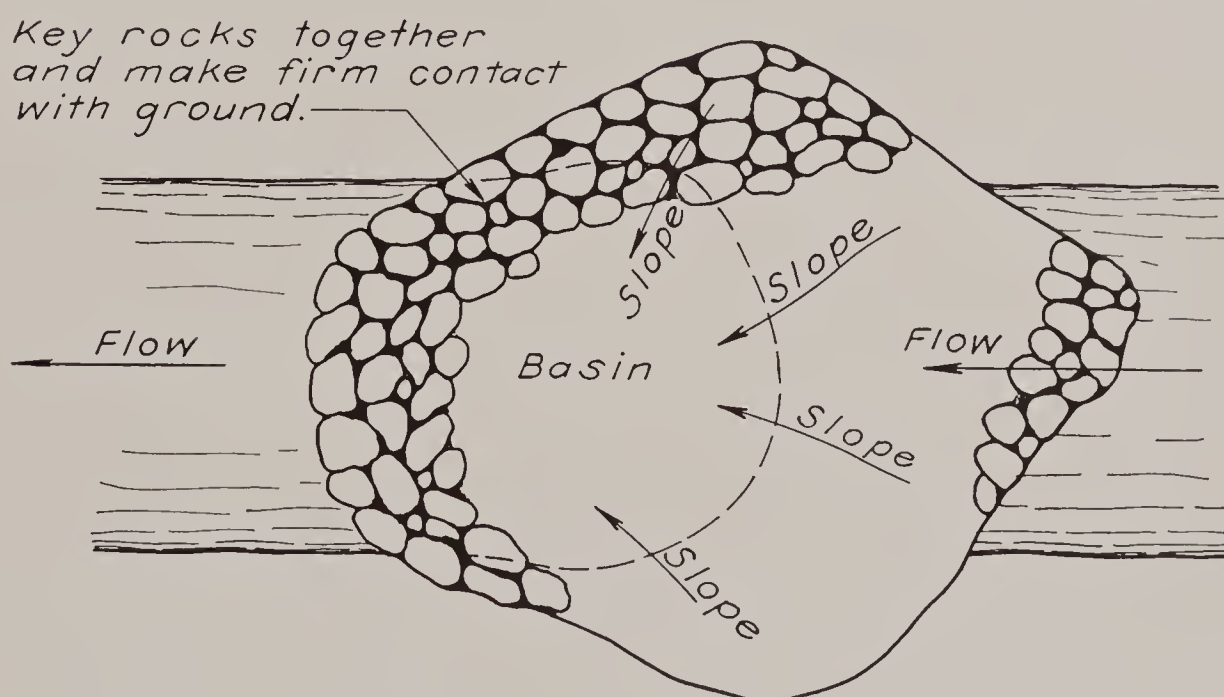
### Gully-head Plugs

#### *Construction procedure*

1. If gully-head has an overhang, the undercut portion should be cut off and sloped back to break fall of water and allow for placing rocks flush with the top of the bank.
2. Pack the gully-head with rocks bedded in pine needles or other litter, tamping the needles into the spaces between the rocks, making the whole structure as compact as possible.
3. The plug should have a slope of about  $1\frac{1}{2}$  or 2 to 1, i.e., extend the rock work down from the head of the gully about  $1\frac{1}{2}$  or 2 times the height of the gully-head.



ELEVATION THROUGH PLUG



PLAN OF PLUG

Figure 24.—TYPICAL ROCK GULLY-HEAD PLUG

4. The surface of the plug should be as smooth as possible, using flat rocks if available, carrying them up and tying them into the sod, so that the water runs directly from the sod onto the rocks.
5. The rocks should be laid well up on the sides of the gully-head, forming a sort of trough to carry the water. (For construction details, see figure 45, page 52, "Handbook of Erosion Control Engineering on the National Forests—1936.")

### Check Dams

Such structures are designed to decrease the velocity of the water as it moves down the gully and to control its fall. In so doing the silt load is deposited instead of additional material being carried away. In addition, the raising of the stream bed raises the water table. The influence of velocity upon the rate and effectiveness of silting in, and consequently upon the time required to reclaim the gully, should be fully appreciated. This is especially important in case of the larger watersheds involving correspondingly large flows.

#### *Principles of location and construction*

1. Numerous dams from  $1\frac{1}{2}$  to 2 feet high are preferred to few high ones, although an occasional higher structure may be advisable in special situations. Higher structures have their use generally where the gradient is fairly steep, 2% or more, and the gully is quite deep, in excess of 5 or 6 feet.
2. Reclaim gullies by stages with a series of low dams built either on top of or just upstream from the original dam after the original catchment basins are filled. (See Figure 25.)

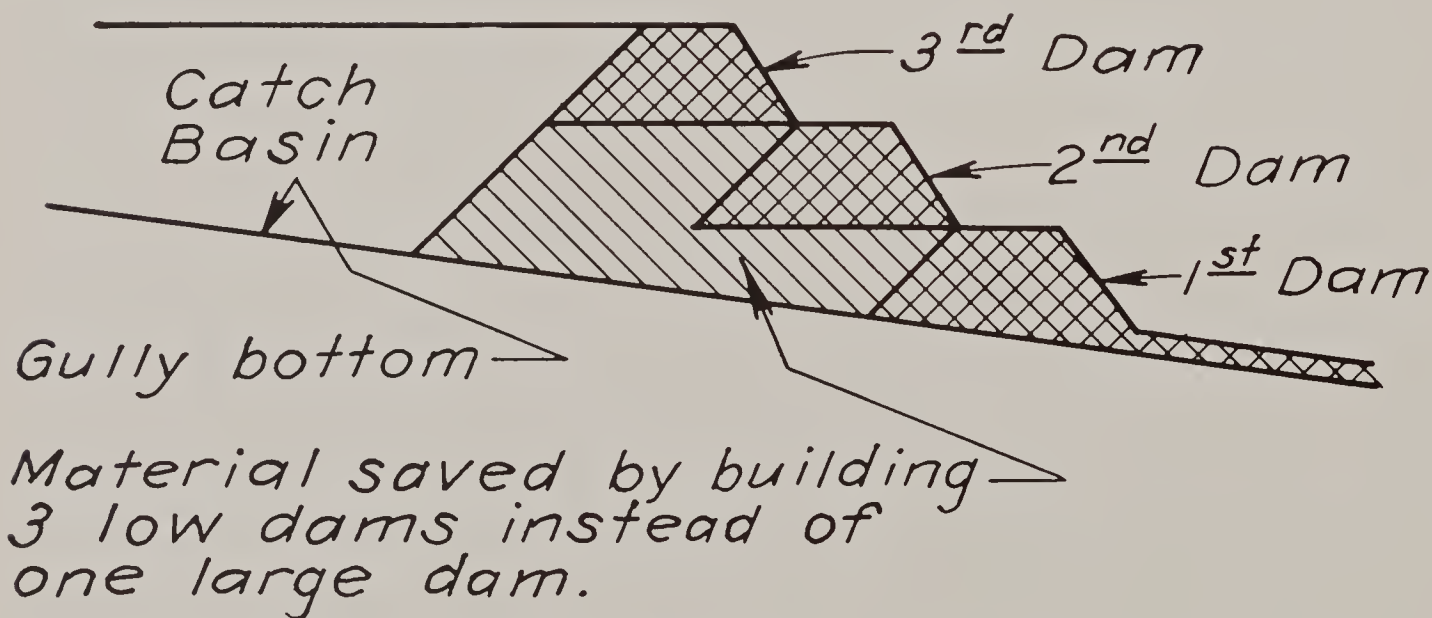
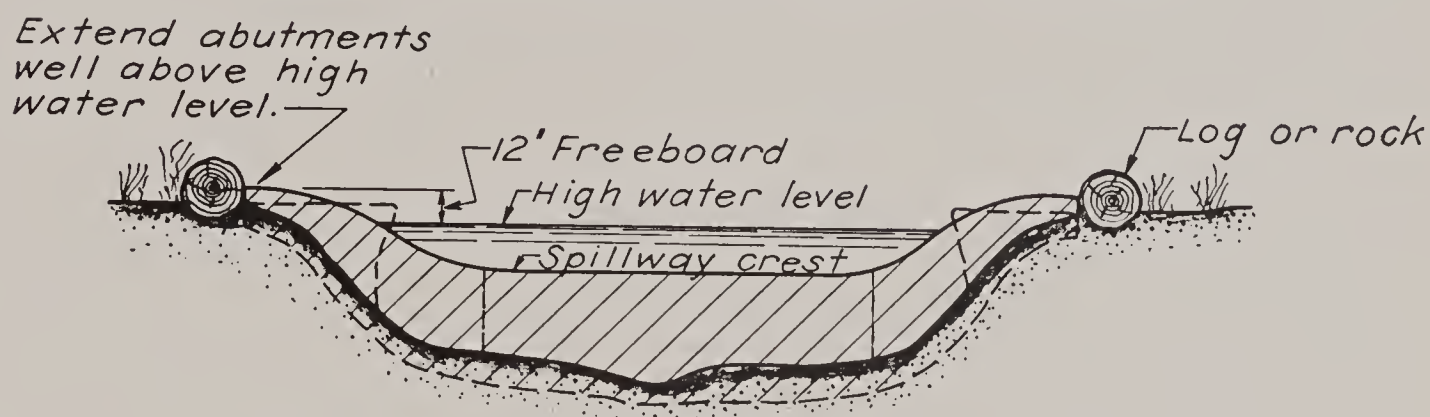


Figure 25.—SIDE SECTION OF A GULLY SHOWING THE SAVING IN CONSTRUCTING SEVERAL LOW DAMS PERIODICALLY RATHER THAN ONE HIGH DAM

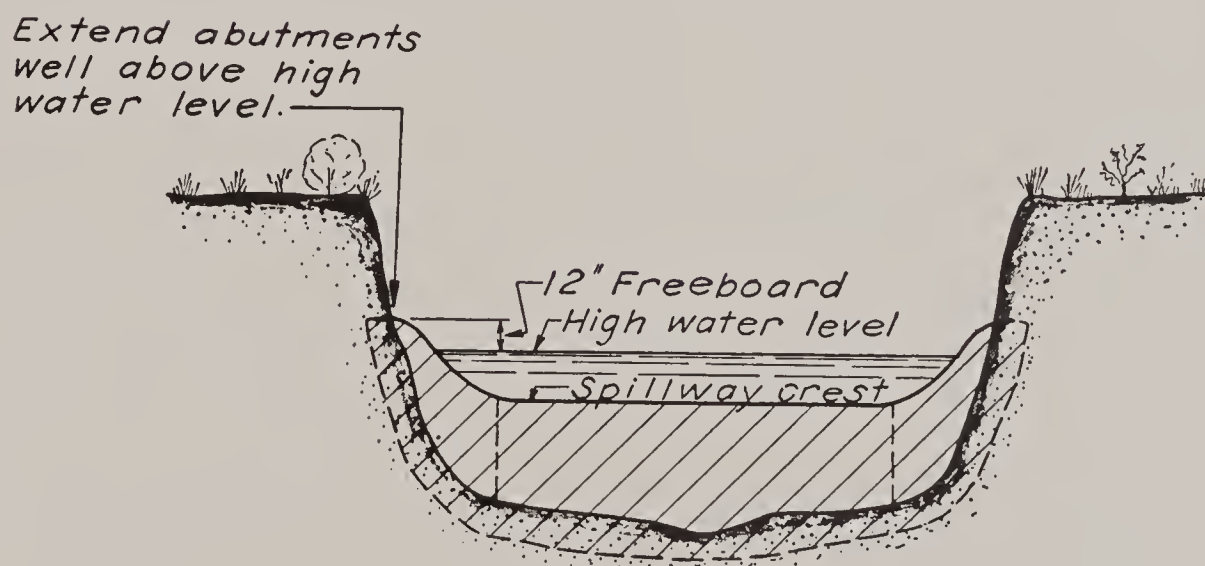
3. The distance between dams should not be so great that the gradient from the crest of one up to the toe of the next above exceeds  $\frac{1}{2}$  of 1%. The catchment basins behind a series of dams usually will cover at least one-half of the total length of the gully.



4. Place check dams in key locations, such as (a) below the conjunction of two or more gullies, (b) at narrow points, provided the spillway area is not unduly restricted thereby, (c) where gully is not eroding as rapidly as at other points, (d) where longest possible stretch of channel will be flooded, (e) where rock outcrops will assist in construction, (f) where the gully below the structure is straight or nearly so.
5. In addition to building strongly to resist severe storms, provide adequate spillway capacity to safely carry flood waters. (Figure 26.)



SHALLOW GULLY



DEEP GULLY

Figure 26.—TYPICAL ELEVATION OF GULLY AND CHECK DAM, SHOWING SPILLWAY AND ABUTMENT ARRANGEMENT

6. To prevent undercutting, build an apron below the downstream face of the dam. (See figures 47-50, pages 55-59, "Handbook of Erosion Control Engineering on the National Forests—1936.")

In gullies that develop on streams of low gradient, it often is possible to raise the water table and hasten the recovery of the meadows. Such dams should be impervious and impound sufficient water to make conditions suitable for rapid plant growth. These dams will create ponds and hold silt which will serve as ground water controls if the flow is permanent. Design for a simple concrete or masonry dam of this type is given on page 60,

“Handbook of Erosion Control Engineering—1936.” Rock dams, however, can be made sufficiently impervious by providing an earth seal on the upper side. For structures of a more complex type, design can be secured from the Division of Engineering.

### **Channel Control**

The object is to stabilize the banks of well-established gullies and stream channels which border or traverse meadows.

1. Bank fixation by sloping back to about 70% slope on an average.
2. Building light structures to break water's force.
3. Brush wattles and seeding.
4. Planting along banks to stop cutting.

(See pages 53-58, “Handbook of Erosion Control in Mountain Meadows in the California Region—1934,” by Charles J. Kraebel and Arthur F. Pillsbury.)

### **Cutting and Seed Plantings**

The planting of willow cuttings is an effective, quick means to secure vegetative cover and expedite stabilization. (See Kraebel and Pillsbury, pp. 46-52.)

The revegetation of barren areas may be speeded up by artificial re-seeding.

## **WATER DEVELOPMENTS**

Water is developed on national forest ranges for the following purposes:

- a. To provide for a more even distribution of livestock over ranges.
- b. In order to secure utilization of areas otherwise not usable because of the lack of water.
- c. To improve quality of water for livestock.

As a general rule the following distances between water supplies are desirable in the interest of stocking and utilization:

Cattle should not have to travel over  $\frac{1}{2}$  mile to water in rough country, 1 mile in rolling and 2 miles on the level. Sheep watering places may be up to 3 miles apart in level country. Here sheep can graze from one to the other in two days without trailing. In rough country, sheep should not have to travel over  $1\frac{1}{2}$  miles to water. A general condition with such extreme distances to water however means a limited number of watering places and consequent damage around them.

Obviously, water developments for cattle can be made to advantage on seeps of limited supply since but a few head need be taken care of at a time, but sheep watering places should be developed on the basis of a supply adequate to water an entire band at a time. This means a minimum of 60 lineal feet of troughs, and a capacity of 2000 gallons, part of which may be in a storage tank. Cattle drink a maximum of 6 to 10 gallons daily and sheep  $1-1\frac{1}{2}$  gallons at each watering. The major types of livestock water development in the Region are:



- a. Springs and seeps.
- b. Wells with windmills or pumps.
- c. Reservoirs.

Pipes and troughs will be used in connection with practically all installations under (a) and (b).

In planning such improvements the Forest Service Handbook, Small Water Developments, 1935, should be consulted.

### Springs and Seeps

Before planning any development, it is essential to carefully check the flow of the spring or seep over a reasonable period of time to be certain of the quantity and reliability of the source. Plan to have water available in all troughs during the grazing season for the use of livestock and to prevent possible damage from horses pawing the trough, should the supply fail.

Where a string of troughs has insufficient capacity for a full band of sheep they must depend on refilling as sheep drink. This should be fairly rapid in order to water a band in minimum time. Where storage tanks are used the outlet should be large, preferably 2 inches or larger.

A flow less than one gallon per minute is not sufficient to justify development for regular use by sheep.

#### Head box

Figure 27 shows the most desirable method of enclosing and piping water from a small spring.

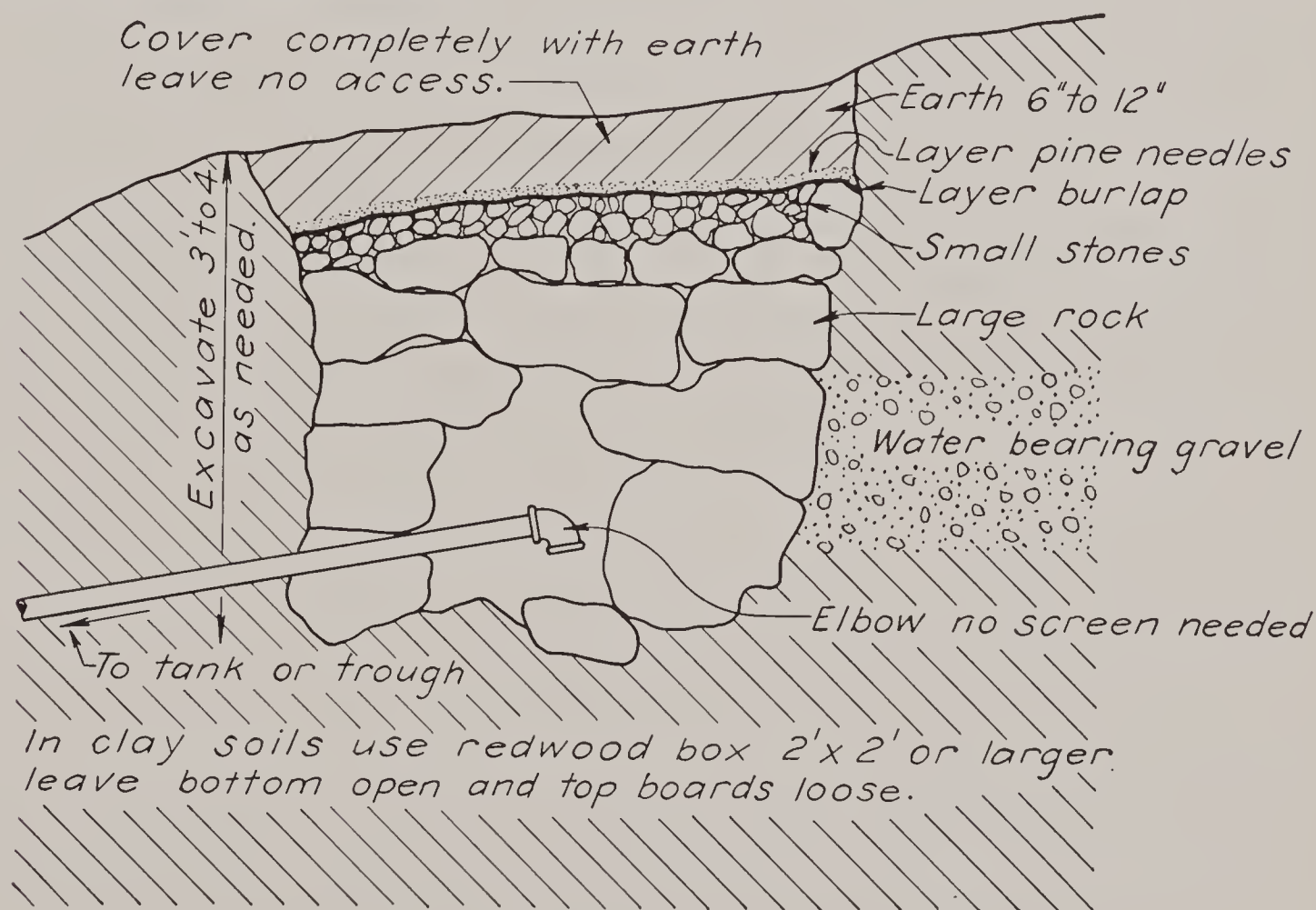


Figure 27.—PIPING WATER FROM A SMALL SPRING

Installation suitable for tapping small springs where all water will be piped away.

Drainage effect eliminates plants that otherwise attract livestock.

Requires no attention. Permanent.

Springs with large flows or in marshy areas should be fenced. Here the spring should be enclosed in a well-built box of cement, masonry or red-wood and fixed with a tight cover to keep out debris and rodents.

### *Lead-in pipe*

This runs from the head box to troughs. Always use galvanized iron pipe and not less than  $1\frac{1}{2}$  inches in diameter. If there is likelihood of clogging, the pipe should be as straight as possible to facilitate cleaning. It must be protected from livestock damage. It may be laid underground to the base of the trough where a "T" is installed with a plug which will facilitate cleaning and draining. The vertical pipe should lead to the top of the trough with elbow over the edge. This is better than to cut a hole through the trough. Where there is danger of freezing, plug or draincock should be provided so that all of the system can be drained.

A No. 9 wire passed through a pipe helps to clean it. Blowing in the lower end of the pipe will often open a clogged pipe.

### *Pipe lengths*

Unless there is need for definite lengths, order "random." This runs from  $19\frac{1}{2}$  to  $21\frac{1}{2}$  feet and is cheaper.

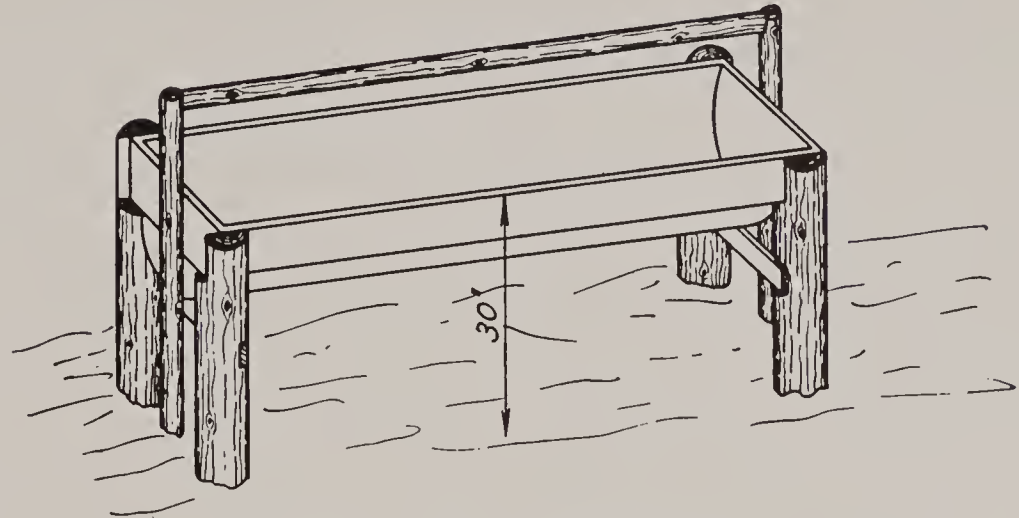
### *Trough framing and foundation*

It is essential that this be substantial to carry not only the load of water but also to absorb the strain due to the rubbing and crowding of livestock.

Level off the site; set substantial, durable posts on each side from 4 to 6 feet apart with cross-pieces of 2x6's to prevent posts from spreading; parallel with the trough and under the flange on each side set a 2"x8". To prevent sagging do not join these timbers but have the joints meet at the posts; attach the flange of the trough to the 2x8's with screws through holes drilled there when the tanks are made; put a rail above and parallel with the troughs to prevent livestock from jumping over; on level ground put railing above the middle so livestock can water on both sides; on side hills it may be put on one side only. (See Figure 28.)

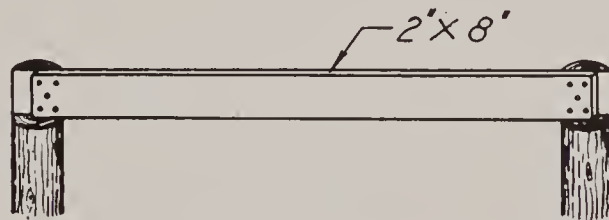


# FLUME TYPE WATERING TROUGH

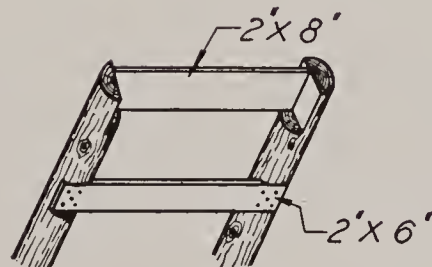


## SKETCH OF TROUGH

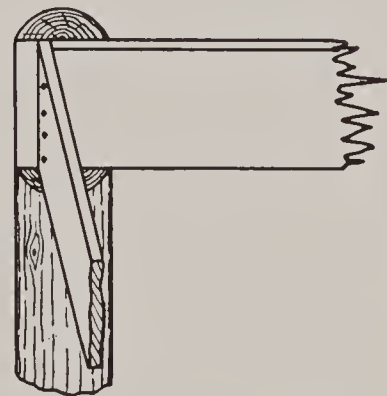
*Posts should be 6" or more top diameter  
Jump bar 4" diameter or 2'x 6" plank.*



## SIDE DETAIL



## END DETAIL



## END DETAIL FOR FRAME

*For longer troughs more posts are set along side with the 2"x 6" piece to prevent spreading and support bottom of the trough.*

FIG. 28

Concrete base

A concrete base may be substituted for posts and plank where sand and gravel are readily available and suitable local posts cannot be secured. The cost is not much in excess of the other type of installation. Figure 29 shows the details of such an installation.

# CONCRETE BASE FOR SHEEP WATERING TROUGH

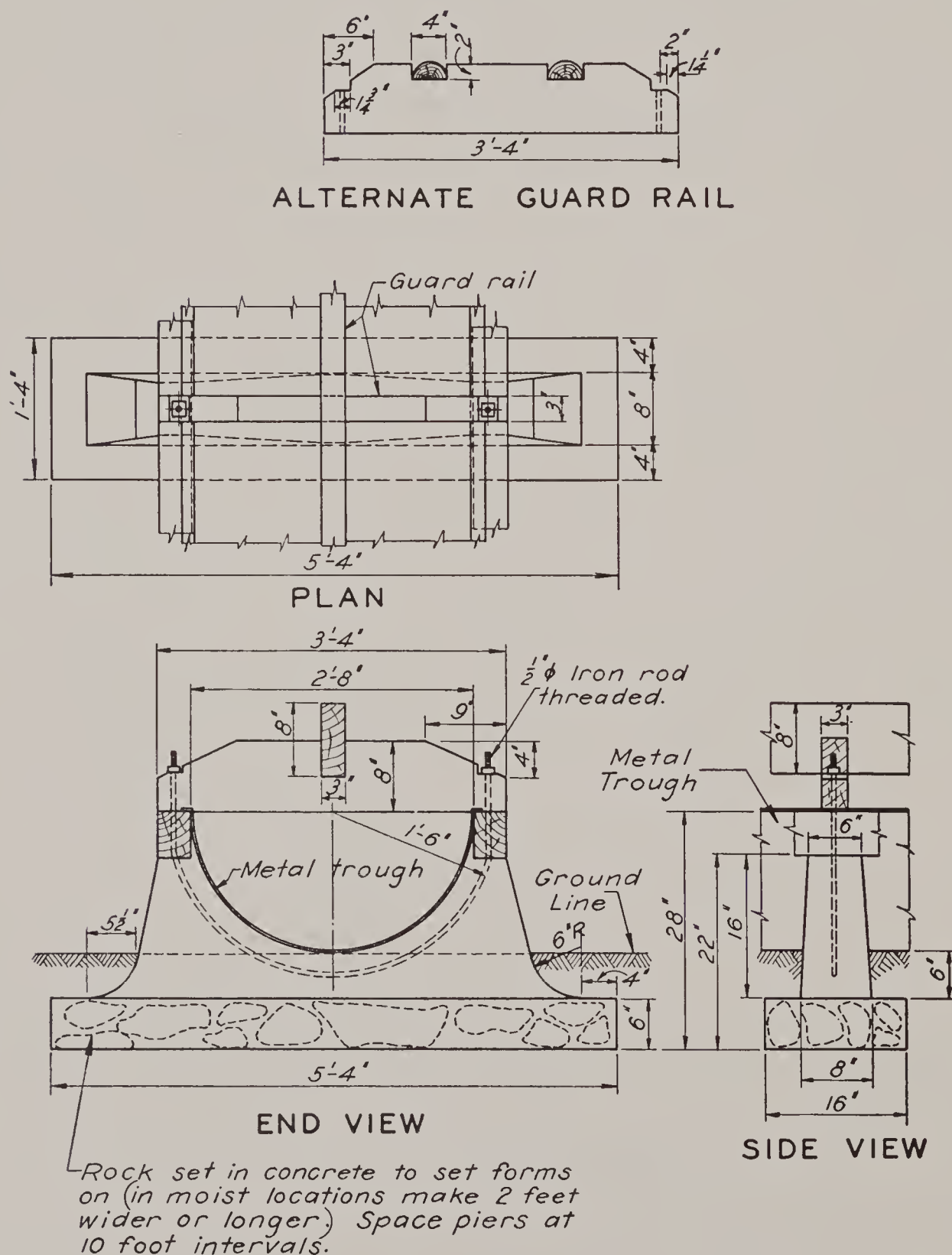


FIG. 29



The bill of material for a 10-foot section for trough installation and concrete base is :

- 1/2 bag of cement per pier.
- 1 bolt of iron rod 1/2"x70" threaded on each end with nuts and washers
- 2 bolts, 3/8"x9" with nuts and washers.
- 1/2 lb. 10d galvanized nails.
- 2 pieces 4"x6"—10' rails.
- 2 pieces 4"x6"—32" end pieces.
- 1 piece 3"x8"—36" or 3"x10" plus one piece for trough (cross-piece).
- 1 piece 2"x8"—2' to be tapered
- 1 piece 1"x12"—6' } pier form

Average cost of installation around \$8.00 per 10-foot length exclusive of ground preparation.

### *Troughs*

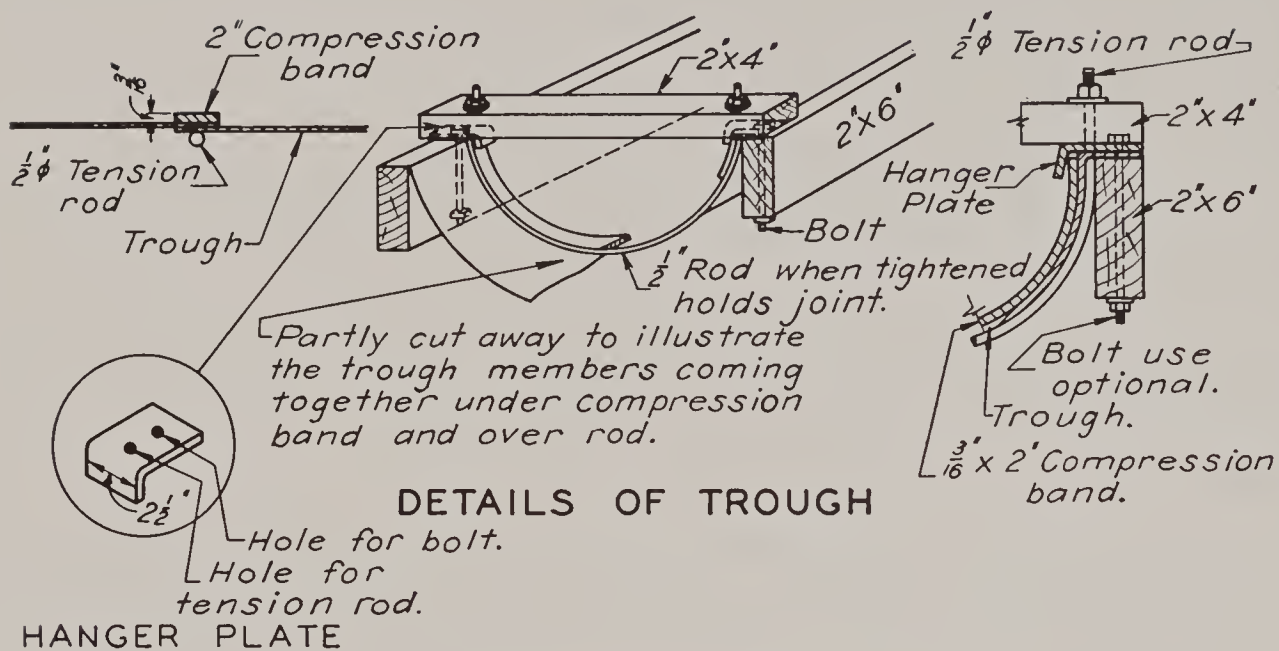
Where good trees without wind shake are immediately available and where the transportation costs are high, log troughs may be used. Where well placed and filled with water at all times they will last indefinitely. Otherwise galvanized sheet iron or concrete troughs or circular tanks should be used.

Both sheep and cattle troughs of galvanized iron are available in standard sizes as follows :

Length	Width	Capacity	Cost F.O.B. Factory
10'	28"	153 Gals.	\$12.30
10'	38"	296 Gals.	\$16.25

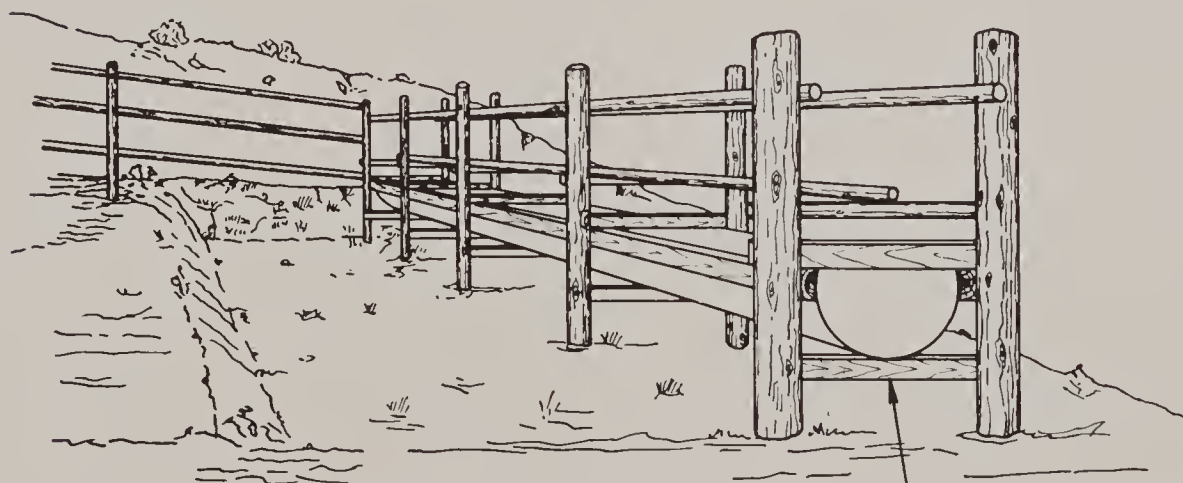
Galvanized iron troughs should be of at least 16 gauge. The Lennon continuous or flume type trough is excellent for sheep. Suitable Lennon type flume comes in 23, 27 and 30 inch widths. The cost per foot is about \$0.65, \$0.77 and \$0.87 respectively. Their capacities are 10, 15 and 18 1/2 gallons per foot. The method of installing Lennon type troughs is shown in Figure 30.

# LENNON FLUME TYPE WATER TROUGH



## INSTALLATION

*Note: It is not necessary that side and center rails be placed as shown below, some use this design and others place two rails on each side; some do not use a center rail.*



## SKETCH OF TROUGH

*Brace under trough should be at ground surface for sheep but higher for cattle so top edge of trough is not over 30 inches above the ground level.*

FIG. 30



When troughs are installed in batteries, connect with pipe from the bottom of one to the appropriate level of the next unless steep ground requires stepping down with overflow pipe at water level of upper trough. Foundations must be especially good to avoid settling or sagging, overflowing and undermining foundation.

Merits of the two types of troughs:

*Battery type*

- a. Most economical; least material.
- b. Trough nearest to water supply is always usable.
- c. Easier to set up in uneven ground.
- d. Where water is short and several animals are watering at one time, stronger may keep weaker from trough where water is running in.

*Lennon type*

- a. Greater care needed in leveling.
- b. More expensive.
- c. Small quantity of water available to all livestock.

### Circular Troughs for Cattle

Corrugated circular metal troughs are available in the following sizes:

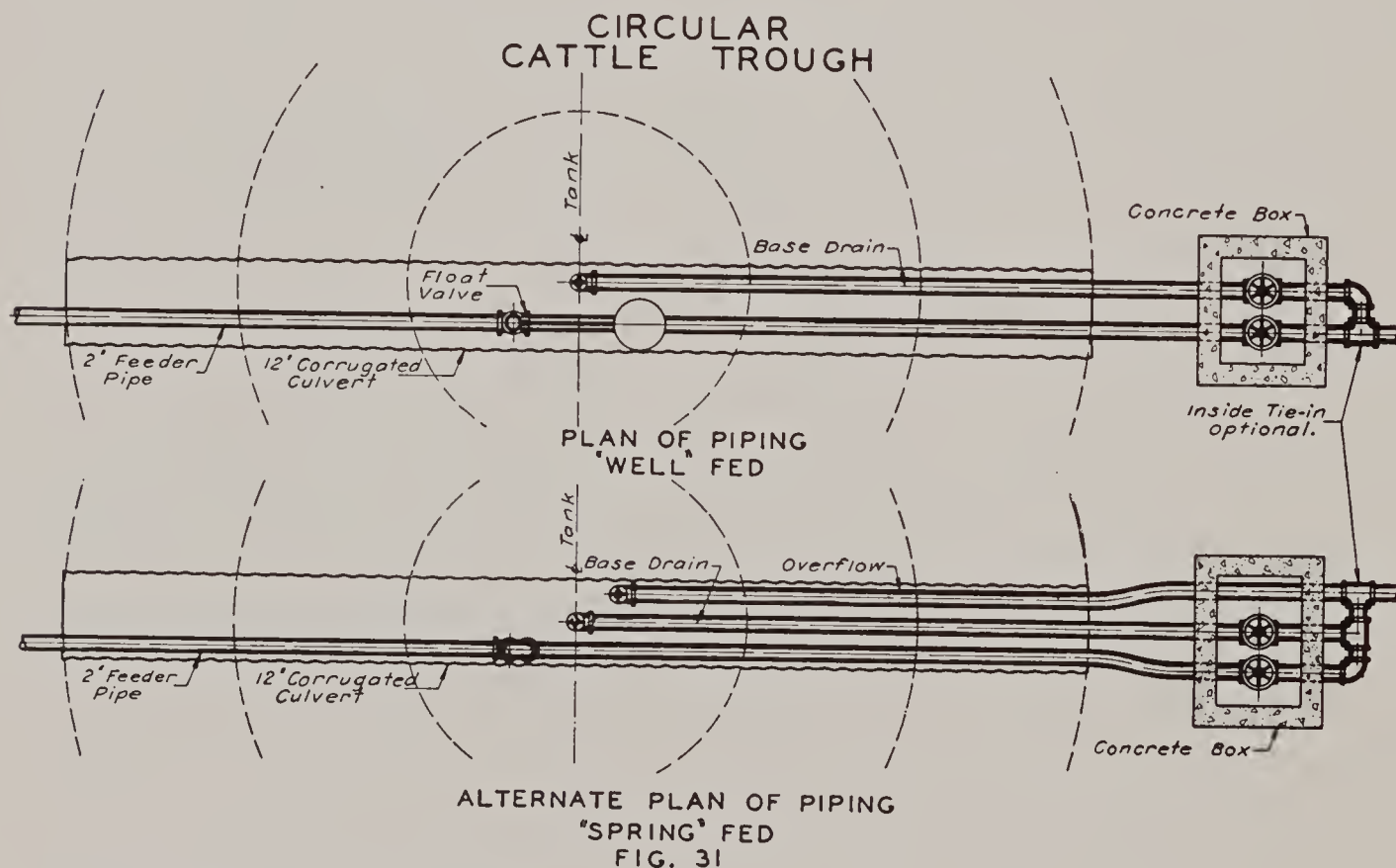
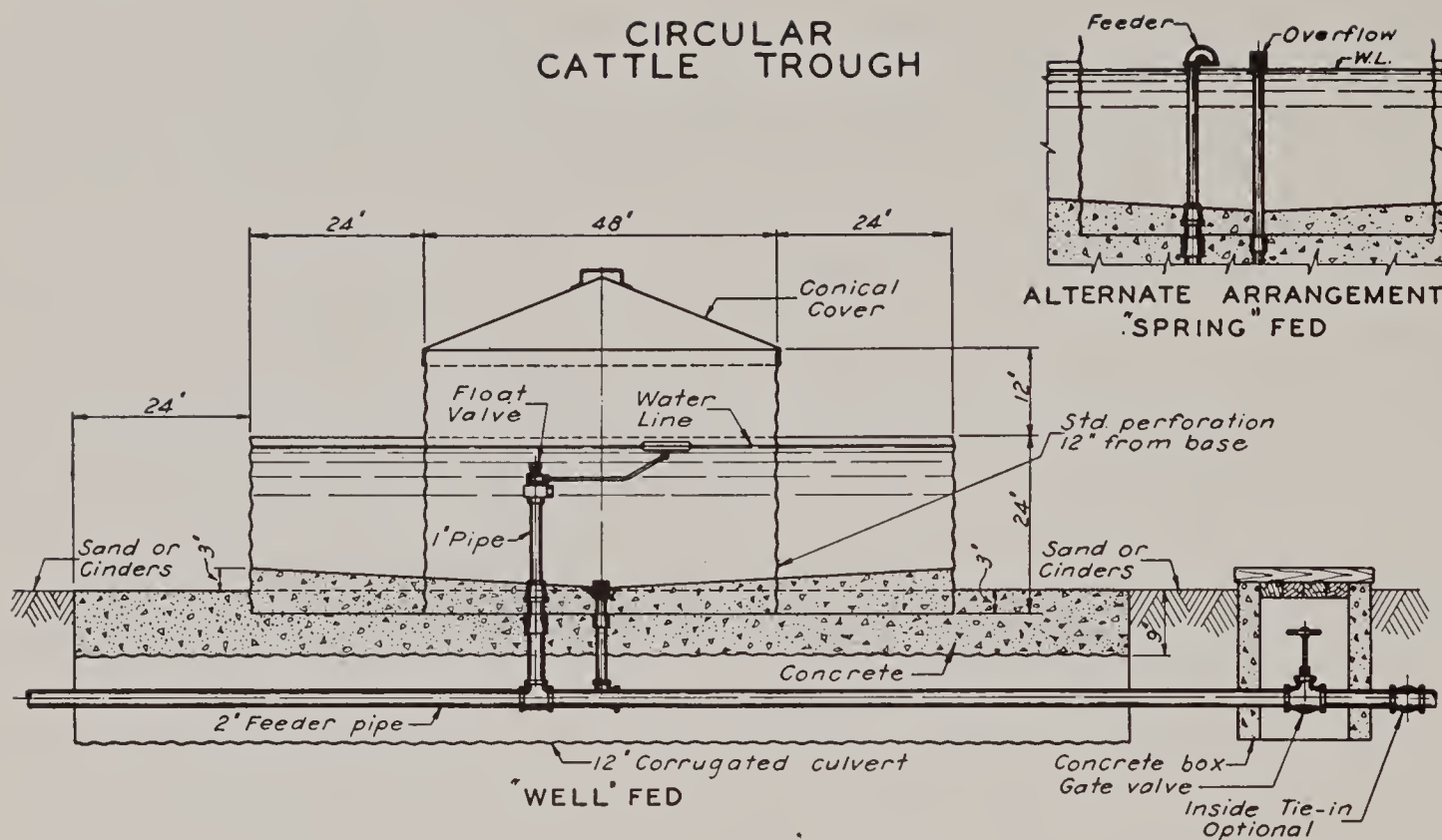
Diameter	Gals. Capacity	Cost F.O.B. Factory
5'	250	\$20.00
6'	300	\$26.00
7'	350	\$32.00
8'	400	\$42.00

These are installed by laying a 9" concrete slab with a 1-2-4 mix. Reinforce with light steel or discarded telephone wire or wire mesh. Set trough in cement while wet and level accurately, tamp well, add concrete inside to provide a 1:20 slope to drain and finish with neat cement.

If a float valve is needed, set a section of 30" culvert in the center at the same time and install intake, float valve and overflow pipe in it.

See Figure 31 for circular troughs.

## CIRCULAR CATTLE TROUGH



Their advantages include:

1. Lower cost per unit of capacity.
2. Low maintenance cost.
3. Less susceptible to damage.
4. Valuable in connection with stored water.
5. Adequate room for livestock.

### Overflow

It is necessary to carry the water away from troughs to prevent making a mud hole and to prevent undermining or damaging the foundation.



*Method A.* Rivet a floor flange to the bottom of the trough on the underside. Attach 10-inch pipe or such length as needed upward from this to the desired water level. Install a "U" at the top of the overflow pipe to prevent clogging by debris. A lock nut used on this pipe and screwed down to the floor flange makes it more rigid.

*Method B.* Rivet a floor flange to the end of the trough at the desired water level. Sufficient threads should be run on the 6" section of lead-off pipe to permit it to screw through the floor flange enough that an elbow can be screwed onto it.

Drill an air hole in the highest point of an elbow or "U" used for such purposes to avoid the possibility of the siphoning out of the water down to the open end and thereby prevent clogging. The lead-off pipe should be carried downward close to the trough to prevent damage by livestock and carried at least 20 feet away, with the end in a rock pile.

#### *"Moss" in troughs*

A green algae growth commonly called "moss" frequently develops in water tanks and troughs. They can be kept free of this by using blue vitriol (crystalline copper sulphate). A dilute solution of one part in a million will keep the water free from algae. This amount is perfectly safe for livestock. A few crystals put in a small bottle with a small slot cut in the side of the cork to keep the sulphate from dissolving too rapidly will give concentration enough to keep out the algae.

#### *Birds and rodents in troughs and tanks*

If trouble develops from birds or rodents drowning in tanks or water troughs leave a short piece of board floating in them. Advise the stockmen of their purpose and replace them when well-intentioned people throw them out. For water troughs a strip of hardware cloth may be fastened on the inside of the trough in a manner that will assist rodents to escape.

#### *Float valves*

Where water supplies are limited and drawn from a storage tank, a float valve is needed. These should be protected from livestock with a strong cover. It may be desirable to hinge the cover to one side rail of the trough and fasten to the other with a hasp. This permits easy access for necessary adjustments.

#### **Wells and Windmills**

Such installations are occasionally necessary in order to utilize ranges on which there is inadequate living water subject to development. They are quite expensive, costing for a 12-foot mill around \$125.00 F.O.B. factory. Where the drilling is contracted the cost for a 4-inch well, fully cased, is \$3.50 to \$6.00 per foot depending on depth. Where the Forest Service handles the job with one of the Regional outfits there is usually considerable saving. Where wind is not dependable it is necessary to power the pump with a gas engine. Plans and specifications for windmill installations and storage tanks are available in the Regional Office.

## Storage Tanks

Because of the close attention required, use of wooden tanks is not approved for water storage on ranges. No. 16 galvanized sheet iron is recommended for general use. The standard sizes are :

Diameter	Height	Gal. Capacity	Cost F.O.B. Factory
6'	5'	1000	\$62.00
7'6"	6'	2000	\$87.00
8'3"	7'6"	3000	\$98.00

The foundations should be a concrete slab on a leveled and well-settled surface.

An overflow pipe should be provided to carry surplus water away from the foundation.

### *Things to guard against in water development*

1. Clogging of pipes by debris. Caused by improper protection at source or too easy access to head box by public, leaves and debris falling into head box.
2. Freezing. Caused by failure to drain or impossibility to drain because of sag in pipe line.
3. Failure of water supply. Insufficient excavation and getting head of pipe too high.
4. Air locks. These may develop in pipe lines with low pressure and with rising sections where water is forced upwards over barriers or to troughs or tanks. This problem may be solved by :
  - a. Installation of  $\frac{1}{2}$ " automatic air vent valves (cost about \$6.00) at the top of rising sections.
  - b. Installation of standpipes at the top of rising sections. These should rise to the height of the intake on pipes leading to float valves or faucets and to a height of 2-3 feet where water is running continuously.
  - c. Re-laying the pipes on a continuous downward gradient from the source to outlet.
5. Back filling on slopes. The uphill side of a trough should be excavated (in the leveling process) for a distance of 10 feet and a slope of at least 1:10 away from the trough, to take care of sloughing.
6. Sagging troughs caused by improper construction or by leakage or by failure to pipe overflow away from the trough.
7. Leakage. Chemicals in the water sometimes damage galvanized troughs. This can be overcome by painting them on the inside with tar or a paint with an asphalt base or cement roof paint. Troughs of lumber or logs should be kept full at all times to prevent cracking.



## Reservoirs and Borrow Pits

Such structures are valuable as a source of range water where soil and topography permit their construction. However, this type of development is not of Region-wide application or interest so no description or specifications will be given. See I. C. C. Handbook "Design and Construction of Forest Service Dams—1935."

## FENCES

Fences are a vital part in any extensive range management program since many phases of the control of animals that are not herded are directly dependent on such structures. The following classes are common to the Region:

1. *Boundary*: To prevent trespass.
2. *Drift*: To prevent livestock from getting off the range allotted to it; to confine herds to proper elevational zones.
3. *Division*: To divide ranges for proper utilization of each portion thereof.
4. *Pasture*: To provide facilities to better handle livestock on the range such as enclosures for saddle and pack animals; to hold livestock temporarily during round-ups or at any other time or, to reserve feed for special uses such as for the livestock of tourists.
5. *Protection*: To prevent use of areas that are particularly susceptible to damage from livestock such as those being treated in erosion control; or to keep livestock away from limited areas with heavy stands of poisonous plants.
6. *Plot*: To exclude livestock or rodents from range study areas.

### Specifications for all Livestock Fences

Normally only barbed wire fences will be used for range purposes. Two-point American Glidden twelve-gauge wire is used. It comes in eighty-rod spools, weighing 78 pounds per spool. Two-inch staples should be used except for toggles in take-down fences where one and one-half inch are satisfactory. Two-inch staples count 50 per pound. One and one-half 73 per pound.

*Location.* The drift of livestock up and down drainages is more difficult to control than across ridges. Therefore fences should be located on primary or secondary ridges where possible and still meet the purposes for which they are being built.

*Clearing.* In brushy country a right-of-way should be cleared on both sides of the fence to a sufficient width to permit a man to ride horseback along it. Obstacles in the fence line such as down logs should be removed instead of stretching the wire over them.

*Number of wires.* Use three strands of barbed wire where the expected drift of livestock against the fence is small; use four strands where this is medium, and five strands only where the pressure is very heavy. In most cases in the Region not more than four wires are required. Where four wires are used the top one should be 48" above the ground. The bottom should be 14" above the ground with the two others evenly spaced between. On three-wire fences the top wire should be 48" above the ground with the bottom 16" from the ground with the other midway between. Using five wires, put the lowest one down to 10" above the ground with the top at 48" and the other three evenly spaced at intermediate points.

Where the fences cross depressions an extra wire may be added with the wires weighted down with a dead-man so the strain will not be on the staples or posts.

*Alignment.* Build as straight as possible.

*Posts.* Posts should be of best material available such as heart incense cedar or juniper. Iron posts may be used where there is danger of destruction by fire or where the cost of the iron post set in the ground is less than that of wood. Where wooden posts are used they should extend at least 58" above the ground and the small end should not be less than 5" in diameter if of cedar or 4" if of juniper. Larger posts should be used at gates and corners. Where a fence is constructed through timber, trees may be used instead of posts but the line should be kept approximately straight and not varied greatly in order to tie to trees. Where trees are used a wood strip should be spiked to the tree and the wires stapled to the strip. Do not drive staples tight against the wire except on end or corner posts. Straight alignment can be accomplished by stretching one barbed wire as a guide for setting the posts, or any other plan desired can be used that will insure a straight fence. Posts will ordinarily be spaced one rod apart.

*Holes.* In constructing fences across stretches of rock outcroppings where digging holes would be very expensive, "jacks" similar to those shown in Figure 32 may be used. The holes in good soil should be at least 24" deep and 18" in rocky soil.



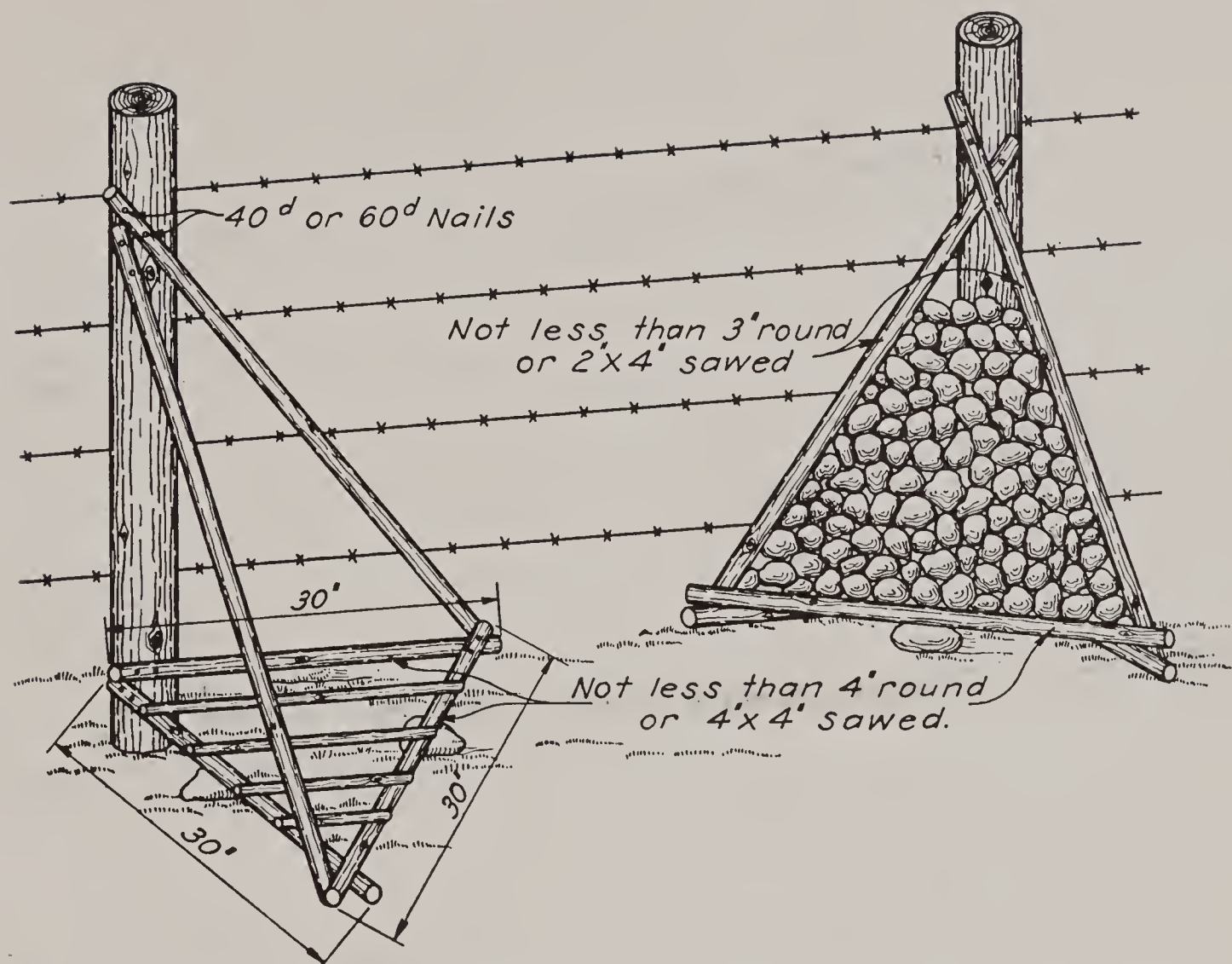


Figure 32.—METHOD OF SUPPORTING FENCE POSTS WHERE SETTING THEM IN THE GROUND IS IMPRACTICABLE

*Bracing at gates and corner posts.* Gate and corner posts should be set at least 32" deep well anchored and braced. The first post should be spaced ten feet from the gate or corner post and braced with 4"x4" timber or 6" pole and four strands of No. 9 wire or two strands of barbed wire twisted above and below the brace as shown in Figure 33.

*Cost.* Cost of four-wire fence, complete, around \$350 per mile.

## BRACING AT GATES, CORNERS OR AT ENDS OF FENCES

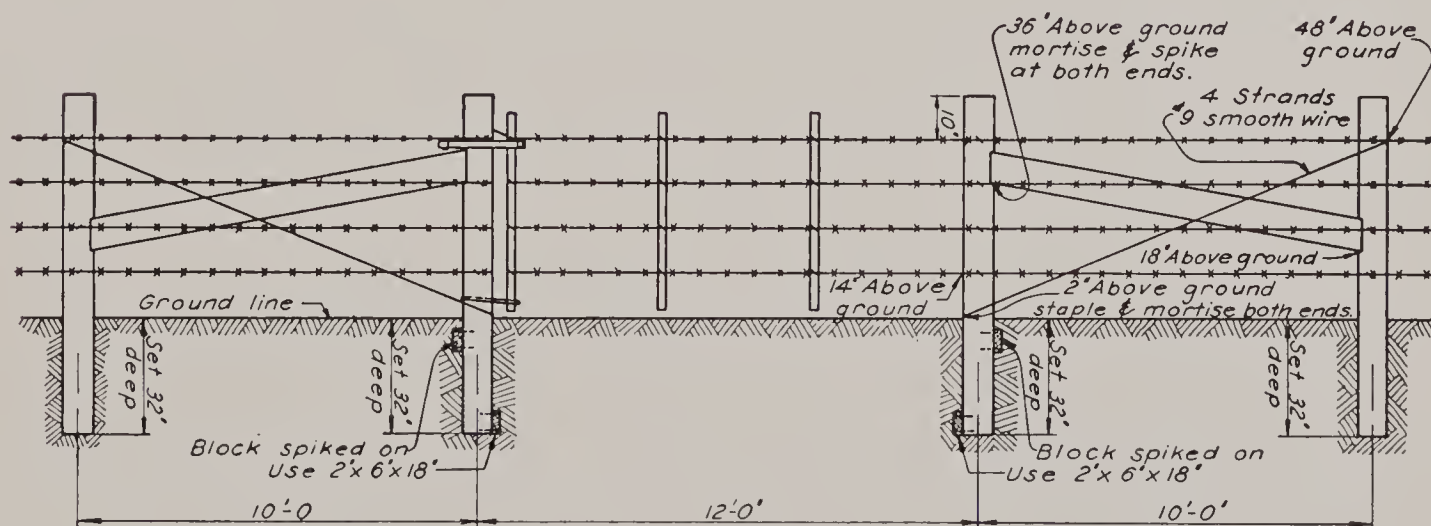


FIG. 33

## **Fences Where Strains from Heavy Snow or Extreme Temperature Occur**

Where fences are located in a region of heavy snowfall the wires should be taken down each fall. In order to facilitate this, two staples should be driven horizontally into the posts, one above the other, with space enough between to include the wire and a third staple placed through the other two as a toggle to hold the wire. One or many stays between posts stapled to each wire keeps them from tangling when taken down and facilitates the replacement of the wires. Where the snowfall is not excessive but sufficient to damage an unprotected fence, poles spiked or wired on top of the posts or in place of one of the middle wires safeguard them. Frequent stays placed between posts also afford additional protection.

Where fences are too inaccessible to take down conveniently each fall, a fence that will withstand snow can be constructed as follows:

Set posts and brace corners as usual; leave 4" sag in all wires between posts; attach two or three stays of native materials between posts using wire or 1½" staples.

Should breaks occur over winter, increase the slack and add stays.

Such structures do not present a good appearance but maintenance costs are sufficiently low to justify their use in many locations where snow fences are required.

### **Cattle Guards**

Where fences cross roads that are more than occasionally used, cattle guards should be installed. (See the Truck Trail Handbook for specifications.)

### **Specifications for Rodent-proof Fencing**

Where the exclusion of rodents from limited areas is essential, a very expensive type of fence is needed. Plans and specifications are available in the Regional Office.

### **Electric Fences**

A recent development consists of the enclosing of areas with one barbed wire 30 to 36 inches high to which a 6-volt battery with a so-called "controller" attached supplies a current of high voltage and very low amperage. Special batteries which will energize as much as ten miles of wire for a full year can be secured. The charged wire is very effective in turning livestock, which are said to learn after an experience or two to leave the wire alone. There is no strain on the wire, so very light construction is practicable.

In dry soils that act as poor grounds, very high voltage up to 600 or 700 volts may be required to provide sufficient shock or else a second wire must be added about 12 inches above the ground. This should be stapled to the posts and grounded at each end of the fence. Such fences should be signed at places crossed by the public so they may be forewarned. Experiments will be carried out under various conditions to determine the practicability of its extended use within the forests. As fast as definite information is



secured it will be passed on to the field. Because of the obvious dangers no "home-made" installations using powerplants or other sources of high voltage should be attempted.

### **DRIVEWAYS, TRAILS AND BRIDGES**

The most urgent present need for livestock driveways is to remove the necessity for trailing livestock over long stretches of heavily used public highways, in getting the livestock to and from mountain ranges. Aside from danger to both livestock and travelers there are numerous delays and annoyances that make joint use a serious handicap both to livestock outfits and travelers. It is imperative that the cooperative assistance of other interested agencies such as the State Highway Commission should be sought to develop new routes for the livestock.

Driveways should be selected and improved with the following principles in mind:

- a. Wide enough to carry the usual size of herds or bands without undue crowding, and without narrow places at dangerous points such as adjacent to bluffs.
- b. With down logs and other obstructions removed to permit free passage of animals.
- c. Close enough to existing roads (but separated therefrom) that camp and calf wagons can be reasonably close to the livestock to service the outfits and to pick up weak or sore-footed animals.
- d. Locate on ridges and through as easy topography as is available with lightest clearing.
- e. Follow natural routes of travel.
- f. Select locations with good water conditions.
- g. Avoid rocky routes.

All driveways should be kept clearly posted, particularly at all possible points of doubt.

It is occasionally necessary to build trails and bridges to open up range and to cross livestock over streams at times of high water. Principles and specifications set in the Trail Manual should be followed on these.

### **SEEDING**

Experimentation in reseeding ranges of low forage productivity has not yet advanced in the Region to where success can be assured. Work will therefore be limited to experiment, until successful practices have been developed.

### **CORRALS, HOLDING**

Such facilities are used primarily to hold cattle over night while they are going to and from the ranges. They vary so much in size and character that no specifications will be set up for them. They may be made of wire, poles or logs depending on their size, availability of funds and suitability of local material. They are usually built by the permittees except where used by many outfits when they may be built cooperatively.

## SALT LOGS, BOXES OR CONTAINERS

Many schemes are followed by stockmen in placing salt on the range. These vary from:

- a. Scattering on the ground.
- b. Using flat outcropping rock.
- c. Using wooden boxes.
- d. Using logs hewn for the purpose.
- e. Using metal containers.
- f. Putting block salt on the ground.

The first practice is not satisfactory because it is wasteful and much dirt is taken in with the salt. The use of hollowed-out logs and wooden boxes is satisfactory where porcupines are not too prevalent. In the latter case a metal container seems to be the best answer.

Block salt is often placed in logs hewn to hold two or more blocks. This results in some saving in salt. However, placing it upon the ground is quite satisfactory.

### Wooden Salt Box

A good wooden salt box may be made of 12 lineal feet of rough 2"x12". Cut two pieces 24" for the bottom and four pieces 22" for the sides. Nail together using 20d. spikes. Bind the corners with metal straps.

### Metal Salt Container

Secure heavy, discarded but serviceable oil drums. Cut oil drums in half with acetylene torch. After cutting in two, burn out the inside to get rid of the oil. Turn down sharp edges  $\frac{3}{4}$ " to 1" on inside. A smooth job is necessary. Paint saltground number or name on the container. If there is likelihood it will be turned over, a piece of plank can be attached to the bottom with 3" lag screws and the container buried 4" in the ground.

## POISONOUS PLANTS

This is not a major problem on the ranges of the Region.

Fairly extensive control work on larkspur has been carried out on several forests by grubbing. It is not always practicable to eradicate larkspur in areas of dense willow or false-hellebore. However, the following suggestions are made for handling desirable projects:

*Crew organization.* Use not over four or five men. Go slow. Be thorough. Have one man, preferably the crew leader, follow the others to find plants that have been missed. If a man is careless, tell him about it, and if he continues such practice, let him go.

*Tools.* A pick with one end drawn out to a chisel form about two inches wide is probably the best tool for all soils. A mattock is good for sand. Such a tool with the spur cut off and the blade drawn out to about nine inches, or a similar special grubbing hoe, are recommended for use in loam.

*Method of grubbing.* Be sure to remove the main part of the root system, including all of the main roots before they divide into small laterals. Where



roots average 2 feet in length, grubbing should be done to a depth of 8 inches. Where they average not over 1½ feet long, 6 inches of grubbing will do. The very large bunches often have shallow laterals. Remove these at least 4 inches from where they leave the main root. Lateral roots that have not been grubbed far enough from the main root are often the source of sprouts.

*Disposal of grubbed plants.* Scatter, after shaking the dirt from the roots so they will dry quickly. Do not pile them up or let them drop back into the holes or lie with their roots covered with soil, as they may live and grow.

### **Common Errors**

1. Too early grubbing when plants are small and hard to find.
2. Missing plants.
3. Too shallow grubbing.
4. Not grubbing wide enough to get all the roots.
5. Letting pieces of crown drop back into the hole.

In areas where larkspur is found in both wet and drier sites, a second grubbing the same season may be desirable to get the slower growing plants. In all cases careful regrubbing should be planned for the second year and further maintenance as necessary.

### **BEAVER**

Considerable possibilities appear to exist in the planting of beaver in mountain streams where it is desired to conserve the water supply. This idea has worked well on at least three forests and will no doubt be extended.

Beaver require aspen and willow for food and permanent streams having stretches with a slow-moving current in which to build their dams and houses. Technical inspection of places proposed for planting will be made by the Regional Office.

### **RODENT CONTROL**

Any extensive program of rodent control on national forest ranges will be done only in accordance with recommendations and under the supervision of the Biological Survey. It will be correlated with control work done by other agencies.

Local projects to alleviate particularly serious situations can be handled as funds and personnel can be made available for the work, if it is felt the importance of the job warrants giving it priority over other work.

### **PREDATORY ANIMAL CONTROL**

The control of predatory animals on the national forests is principally the responsibility of the Biological Survey.

#### **Coyotes**

The control of coyotes is handled by the Biological Survey in cooperation with the State Department of Agriculture and certain counties. Some counties pay bounties on these animals. The State Division of Fish and Game

handles coyote control work in the game refuges and in certain important game areas.

While coyotes will occasionally kill young calves, the problem involves largely sheep and game animals. Losses of sheep are heaviest on lambing ranges but are often important on the summer range. On important game areas sheep losses drop off at the beginning of the fawning season.

The job of the range manager is to secure data on the losses from this cause, study the local problem, and recommend to his supervisor the action needed. He must not lose sight of the fact that the coyote is an important factor in wild animal populations and his complete removal may have violent repercussions. He may have minor effect on small, rapid-breeding animals such as ground squirrels, but generally the effect of his absence on deer herds is more marked. In several areas in the West, the control of the coyote has been a major factor in deer herds increasing out of all bounds, resulting in a necessity for reduction in livestock numbers, damage on crop lands, and even severe competition with domestic livestock on ranches.

In some cases local livestock associations assess their membership under special rules approved by the Forest Supervisor for the creation of a fund for coyote control. This is turned in to a cooperative fund for work by the Biological Survey.

### **Mountain Lions**

The mountain lion is rarely a problem in connection with livestock. State and county bounties, together with hunters employed by the State, are fairly effective in controlling their numbers. The U. S. Biological Survey in agreement with the State Division of Fish and Game does not participate in the control of mountain lions in California.

### **Bear**

Individual bear, probably old ones that have lost their ability to rustle, occasionally attack sheep. Severe damage has occurred by sheep becoming frightened by bears and piling up in gulches in their mad scramble to escape, with the result a number are smothered. Three hundred head were lost in this manner one day on one forest. The State law permits the taking of bear at any time when destroying property. Forest officers are rarely called upon to assist in their control.



# **RULES OF THE GAME**

## **COOPERATION WITH THE GRAZING SERVICE**

Many permittees on the east side of the Sierras use range in both National Forests and Grazing Districts. It is common for an individual to graze livestock on a Grazing District in the spring, in the Forests in summer and on a District again in the fall. Serious complications will develop for the stockman unless there is coordination of action between the two Services, particularly when an adjustment is required in numbers or seasons of use. Such adjustments in permitted use by either Service might create gaps in operating set-ups that cannot be filled.

Until a written agreement is executed, the Forest Service will therefore notify or discuss with the appropriate official of the Grazing Service action needed or proposed that may affect the use made by a stockman of a Grazing District.

The Forest Service will make available to the Grazing Service data requested on permitted numbers, seasons, dependency information, and commensurability.

Through interagency agreements range survey methods and estimates will be correlated.

The two Services may cooperate in the construction and maintenance of range improvements where the interests of both agencies are involved.

## **HOW TO HANDLE EXCESS NUMBERS OF CALVES**

Ordinary breeding herds run from 30% to 40% calves. These are generally under six months of age on entering the forest and are therefore not counted in the permitted numbers. Large outfits running only a part of their herds on the forest sometimes run only cows with calves there. When this results in excessive use, reductions are necessary and the problem has two angles.

### **Case 1**

When a single permittee on an individual allotment is concerned.

Reduce permitted number to the point where allowable use of the range is obtained. As a guide, figure that two calves above 30% of the permitted number are equivalent in use to one animal over six months of age.

### **Case 2**

Where a community allotment is involved and only a part of the permittees bring in an excess proportion of calves.

Either cut the preference of all permittees in accordance with manual instructions on "Reductions," to secure proper stocking (after figuring numbers as above). Otherwise, by an association special rule, reduce the preferences of permittees who bring in an excess of 30% calves, again figuring in the excess calves as above so the total number of livestock on the range is what it can carry without overuse.

None of the calves should be included in the permitted number nor should fees be charged for them. The problems outlined are solely those of grazing capacity.

## **SPOTTED FEVER**

Forest officers working in sections of the country known to be infested with ticks carrying spotted fever germs should be inoculated each spring. Immunity carries for but one year.

Family physicians entrusted with inoculation should submit a requisition on the U. S. Public Health Service at Hamilton, Montana, for serum. This will be furnished free.

## **ROUND-UPS**

Forest officers when attending round-ups should conform to the customs of the country. After the requirements of their jobs have been fulfilled, they should cooperate in every way with the stockmen and place themselves under the direction of the foreman. The opportunity for securing good will through being one of the "hands" is exceptional under such circumstances.

## **HERBARIUM**

It is important that each forest herbarium contain a representative collection of the plants which occur thereon. This is particularly necessary with respect to plants of wide distribution and high forage values, as well as all poisonous plants that exist in quantity.

Rangers will not be required to keep herbariums.

Plants should be collected in accordance with the booklet "Instructions for Forest Service Plant Collections." Copies can be secured from the Supply Depot.

## **DATES FOR PAYMENT OF SECOND INSTALLMENT OF GRAZING FEES**

All second payments of grazing fees are due on August 1.

## **INTEREST ON DELINQUENT FEES**

Where the full fees or the first half are paid before the livestock enter the forest, as must normally be the case, or the second payment is made by August 1, no interest is due. In no case should livestock be allowed to enter the forest before payment is made, but if this should accidentally happen, interest should be charged when the first half or complete fees are delayed more than fifteen days after the date of entry or the second payment after August 15. Compute interest at 6%. Show the interest item separately in the letters of transmittal.

## **LETTERS OF TRANSMITTAL**

It is not necessary to send in to the Regional Forester copies of the *Second Payment* letters of transmittal on split fee cases, as the first payment letter will give all of the information needed.



# SUMMARY OF STATE AND FEDERAL LAWS AND REGULATIONS RELATING TO RANGE USE PRESCRIBING PENALTIES FOR NON-OBSERVANCE

No effort has been made to cover the county ordinances in effect with respect to the grazing or control of range livestock. Forest officers must familiarize themselves with such ordinances as are in effect in the counties in which their territories lie.

## PROBLEM

ABANDONED MINE SHAFTS

ASSAULTING FOREST OFFICERS

AUTHORITY FOR TRESPASS REGULATIONS

The Secretary has authority under law to promulgate Regulations under which the national forests can be occupied, used, and protected.

The Government has the right to maintain a civil suit for trespass on private land, the use and possession of which has been waived under Regulation G-3 (D).

BANGS DISEASE

BULL LAW

No person shall permit to run upon any unenclosed land outside of cities, towns, and villages customarily roamed by cattle, any bull over eight months of age that is not a "purebred" bull bred in a herd of one of the recognized beef breeds. This means at the least a bull the ancestral sires of which were registered bulls of the same breed for at least four generations and whose dams were good quality cows of the same breed. One bull must run with each 30 head of cows. No bulls required to less than 10 cows.

For each herd of female breeding cattle (animals 12 mos. or over) or fraction thereof run at large between June 1 and Nov. 1, one bull at least  $\frac{3}{4}$  pure blood of recognized beef breed must be provided. Owners running 15 cows or less can have a bull owned jointly.

## CITATION — PENALTY

See "Fencing Abandoned Mine Shafts."

See "Interfering with Forest Officers."

Fed. Act of June 4, 1897 (30 Stat. 35). Fine up to \$500 or 12 months' imprisonment, or both.

Solicitor's decision of Mar. 19, 1925 on revision of Form 925—Trespass Settlement.

See "Control of Communicable Diseases" and "Quarantines."

Cal. Stat. Chap. 382 to 385. Misdemeanor and liability for damage caused.

Nevada Statutes Mar. 7, 1917 (Stat. 1917, p. 47)—Not less than \$100 fine or more than \$500, or imprisonment in county jail not over 6 mos.

## PROBLEM

## CITATION — PENALTY

### CLOSED AREAS

No one shall graze livestock on national forest areas closed to the grazing of that kind of livestock.

Reg. T-6 B, Sec. of Agriculture—Trespass settlement.

### CONTROL OF COMMUNICABLE DISEASES

Going, being upon, taking, transporting or allowing any livestock on national forest range closed to grazing because of the danger of spread of any communicable or infectious livestock disease except under permit from forest officer.

Reg. T-9 F, Sec. of Agriculture—Trespass settlement.

### CROSSING PERMITS

See "Permits, crossing."

### DRIFTING LIVESTOCK ONTO FOREST

Allowing livestock not exempt from permit to drift onto the forest without a permit.

Reg. T-6 D, Sec. of Agriculture—Trespass settlement.

### FENCE LAW

No trespass on land not fenced; legal fence is 3 horizontal barriers, consisting of wires, boards, poles, or other material in common use; posts not over 20 feet apart; lower barrier not more than 16 inches from ground—space between barriers not more than 16 inches; height of barrier 48 inches from ground.

Nevada, Act of Mar. 24, 1917—(Stats. 1917, p. 415)—Misdemeanor.

See also "Strays."

### FENCES, WILLFUL OPENING, TEARING DOWN OR DESTROYING

Willfully tearing down or destroying fencing or opening any gate, bar, or fence of another and willfully leaving it open without the written permission of the owner.

Calif. Penal Code, 602 (Pt. 1, Title 14)—Misdemeanor.

### FENCING ABANDONED MINE SHAFTS

Owners or persons in charge of land on which abandoned mining shafts, pits, or other excavations dangerous to passers-by or to livestock are located who fail to securely cover or fence such openings or who remove covering or fence.

General Laws Calif. (Deering) Act 4922 (Stats. 1903, p. 283)—Misdemeanor.

Is Board of Supervisors' responsibility for similar action in connection with unoccupied public lands.



## **PROBLEM**

**GATES, LEAVING OPEN**

**GRAZING PERMITS**

**GRAZING WITHOUT PERMIT**

Letting livestock not exempt from permit graze on national forest land without a permit.

**IMPOUNDING OF LIVESTOCK**

Livestock found trespassing on national forest range or any other lands under control of the Forest Service can be impounded by forest officers if not removed from the range upon reasonable notice from such officers.

County Commissioners upon petition of 20% of taxpayers may by ordinance prohibit livestock running at large on roads and highways fenced on both sides.

**INTERFERING WITH FOREST OFFICERS**

Interfering on lands of the United States within a national forest by intimidation, threats, assault, or otherwise, with any person engaged in protection, improvement, or administration of the national forests.

**MINE SHAFTS**

**PERMIT VIOLATIONS**

**PERMITS, CROSSING**

Driving livestock not specifically exempted by the Secretary of Agriculture or driving livestock in violation of the terms of a permit across national forest range.

**PERMITS, GRAZING**

Grazing livestock not specifically exempted by the Secretary of Agriculture or in violation of permit provisions on national forest range.

**PRIVATE LAND TRESPASS**

## **CITATION — PENALTY**

See "Fences, willful opening," etc.

See "Permits, grazing."

Reg. T-6 D, Sec. of Agriculture—Trespass settlement.

Reg. T-12, Sec. of Agriculture—Sale of livestock if not redeemed by owners who must pay costs.

Nevada, Act of Mar. 28, 1919 (Stats. 1919, p. 290)—Livestock may be impounded.

Reg. T-A, Sec. of Agriculture—Trespass settlement.

See "Fencing abandoned mine shafts."

See "Permits, crossing," "Permits, grazing," and "Protected Areas."

Reg. T-6 A and E, Sec. of Agriculture—Trespass settlement.

Reg. T-6A and E, Sec. of Agriculture—Trespass settlement.

See "Authority for Trespass Regulations."

## PROBLEM

## CITATION — PENALTY

### PROTECTED AREAS

Grazing of livestock by permittee on areas withdrawn from use to protect it from damage because of improper handling of livestock thereon after receipt of notice from forest officer and amendment of permit.

Reg. T-6 C, Sec. of Agriculture—Trespass settlement.

### QUARANTINES

Compliance with all livestock quarantine regulations and sanitary measures deemed essential by the Secretary as a prerequisite to the use of a permit for the entry or crossing of a national forest by livestock.

Reg. G-8 C, Sec. of Agriculture—Trespass settlement.

### REMOVING LIVESTOCK

Refusing to remove livestock from national forest range upon instructions from an authorized forest officer when injury is being done thereto because of improper handling of livestock constitutes trespass.

Reg. T-6 F, Sec. of Agriculture—Trespass settlement.

### SCABIES

See "Control of communicable diseases" and "Quarantines."

See "Bull Law."

### SCRUB BULLS

### STRAYS

Any person finding any stray domestic livestock upon premises in his possession may seize the same and have a lien thereon for all expenses incurred in keeping and caring for such animals. In Del Norte, Lassen, Modoc, Shasta, Siskiyou, and Trinity counties, applies only to areas entirely enclosed with a good substantial fence.

Cal. Stats., Sec. 391-402.—Owner is liable for all costs.

### THREATENING FOREST OFFICERS

See "Interfering with forest officers."

### TRESPASS ON WAIVED PRIVATE LAND

See "Authority for trespass regulations."

### TRESPASS REGULATIONS, AUTHORITY FOR

See "Authority for trespass regulations."

### TUBERCULOSIS

See "Control of communicable diseases" and "Quarantines."

### VIOLATION OF PERMITS

See "Permits, crossing," "Permits, grazing," and "Protected Areas."

### WILD HORSES

Destruction of wild horses permitted.

Nevada, Act of Mar. 13, 1913 (Stats. 1913, p. 118).



# APPENDIX 1

## GLOSSARY OF GRAZING TERMS

- Accelerated Erosion**—See “Erosion.”
- Actual Use**—The exact number of animals grazed on a specific area for a definite period of time.
- Adaptability of Range**—See “Suitability of range.”
- Administrative Studies**—Minor studies in various activities undertaken by administrative personnel.
- Advisory Board**—A committee selected by a recognized livestock association to represent national forest grazing permittees in the discussion of grazing matters with forest officers. (For details see Reg. G-7, Manual.)
- Aftermath**—The regrowth on hay fields after final cutting grazed by livestock.
- Allotment, Range**—A definite area of range assigned to permittees for grazing of livestock.
- Allowable Use**—See “Use.”
- Allowance**—See “Authorization.”
- Animal Month**—One month’s feed for one head of livestock of the kind under discussion.
- Application, Grazing**—Form No. 879 submitted by persons desiring national forest grazing privileges, stating numbers and seasons applied for and qualifications for permits.
- Approval Action**—Review and approval of grazing applications preliminary to issuance of permits.
- Artificial Reseeding**—See “Artificial Revegetation.”
- Artificial Revegetation**—Establishment of vegetation on range land by artificially propagating forage plants.
- Authorization**—The numbers and kinds of livestock allowed to graze on national forest lands under authority of the Secretary of Agriculture.
- Authorized Nonuse**—Permission granted to permittees to temporarily waive the use of the range without losing established preference status. (For details see Reg. G-4, Manual.)
- Balanced Operation**—Livestock enterprise in which enough feed and range is controlled to maintain the livestock yearlong.
- Band of Sheep**—A term applied to the number of sheep it is practicable to handle as a range herd, generally from 800 to 1200 head.
- Base Lands**—Owned lands of a permittee upon which his qualifications for a grazing permit are based.
- Bedding-out System**—Bedding of sheep on a new area each night. See “Burro System.”
- Browse**—See “Classes of Forage Plants.”
- Browsing**—Eating of leaves and tender stems of shrubby forage species.

**Brush**—A term applied to areas covered by a dense stand of shrub species. Conifer reproduction often erroneously referred to as brush by stockmen.

**Burro System** — A method of handling sheep on the range, where the herder carries his camp with him on burros and beds the sheep down on a new area each night.

**Calf Crop** (percentage)—The ratio of calves produced to the total number of cows bred.

**Cancellations**—The act of making grazing permits null and void. (See Reg. G-3, Manual.)

**Carrying Capacity**—Not a satisfactory term. Use “grazing capacity.”

**Chaparral**—Brush comprised mainly of non-deciduous species.

**Check Dam**—A barrier structure built in water channels to slow up water velocity and hold silt, to check erosion and aid processes of restoration.

**Class Overgrazing**—Overgrazing by one kind of livestock affecting the plants preferred by that kind.

**Class of Forage**—Forage plants are grouped into three classes according to their form of growth.

1. *Grasses and Grasslike*—includes all palatable species of grasses, sedges and rushes.
2. *Weeds*—includes all palatable herbaceous species other than grasses, sedges, and rushes.
3. *Browse*—includes all palatable shrubs and trees.

**Classes of Livestock**—Applied to a kind of livestock; for example, to distinguish between cows, steers, heifers, calves, etc.

**Closing Date**—Specific date setting the end of the grazing season.

**Commensurability**—The ability to raise adequate feed on owned range and cropland in accordance with proper land use practices for the maintenance of permitted livestock during the time they are off national forest range.

**Commensurate Lands**—See “Base Lands.”

**Common Use**—Joint use of range by two kinds of livestock.

**Community Allotment** — A range allotment on which several permittees graze livestock in common.

**Complementary Range**—Range which aids in rounding out a livestock business by providing forage during part of the year.

**Concentration Area**—Limited areas where livestock naturally tend to congregate. A “hang-out.”

**Conservative Stocking**—See “Stocking.”

**Conservative Use**—See “Use.”

**Continuous Grazing**—Grazing on an area throughout the grazing season.

**Cover Type**—See “Forage Type.”

**Cow Month**—One month’s feed for one mature cow.

**Cropping**—See “Grazing.”



**Crossing Permits**—See “Permits.”

**Deferred and Rotation Grazing**—A system of management which aims at a variation in the time of using different portions of a range during a period of years, in such a manner as to allow the forage plants on each part in turn to reach seed maturity before they are grazed.

**Deferred Grazing**—A system of range use under which grazing is delayed until after seed maturity of forage plants.

**Density**—The per cent of the total area covered by vegetation, expressed in tenths and half-tenths. 10/10 being complete cover.

**Dependency**—The need for forest range in order to secure proper and practicable use of owned ranch property in the conduct of a livestock business.

**Distribution**—Used in the following ways: Distribution of grazing privileges—the allotting of grazing privileges on the basis of qualifications. Distribution of livestock—the locating of livestock over the range to obtain uniform use.

**Distribution Reductions**—See “Reductions.”

**Driveway**—A route designated for movement of livestock to and from its range.

**Ecological Successions**—See “Plant Succession.”

**Economic Unit**—A livestock business of sufficient size to insure an income for a family adequate to provide an accepted standard of living.

**Erosion**—The movement of soil from its original place of formation by action of wind and water.

*Natural*—Soil loss due to geologic processes.

*Accelerated*—Accelerated erosion—soil loss more rapid than from natural processes.

*Sheet*—More or less uniform removal of soil from the ground surface.

*Shoestring*—A series of small furrow-like gullies generally more or less parallel.

*Gully*—Deep channels cut in water ways, usually resulting from accelerated erosion.

**Erosion Dam**—See “Check Dam.”

**Erosion Pavement**—A covering of small pebbles and stones left on the surface of the ground resulting from the removal of fine soil particles through erosive processes.

**Excess Forage**—Forage left ungrazed that could have been utilized without damage by good management of livestock.

**Extensive Range Survey**—See “Range Survey.”

**Feed**—Anything that is fed to livestock as food.

**Feeding**—Supplying livestock with hay or supplemental fare.

**Forage**—Any vegetation which has value as feed for livestock and is grazed.

**Forage Acre**—A unit of measurement of the forage resources of a range from which grazing capacity can be computed. A hypothetical acre of land completely covered (10/10 density) with forage which is 100% edible.

**Forage Acre Requirements**—The number of forage acres or the fraction thereof required to support one animal one month with proper stocking.

**Forage Type**—An association of forage plants to which the species composition give a distinctive character.

**Forage Value**—See “Nutritive Values.”

**Foraging**—See “Grazing.”

**Free Permit**—See “Permits.”

**Grade Livestock**—See “Livestock, Grade.”

**Grant**—Acquiring a preference by a new applicant owning commensurate ranch property by five years of consecutive and satisfactory use of a national forest range under temporary permit.

**Grazed Plots**—A designated area of range set aside for study from which livestock are not excluded.

**Grazing**—The eating by livestock of forage plants grown on range or pasture.

**Grazing Association**—See “Livestock Association.”

**Grazing Board**—A committee selected by a majority of the permittees of a forest or group of forests to act on complaints against administrative decisions, secure settlement of controversies, develop local interests and responsibility in better range management.

**Grazing Capacity**—The number of livestock which a range unit will support in good condition each season over a period of years without injury to the soil, forage, production of timber or water.

**Grazing Line**—A horizontal line on tall shrubby plants up to which animals can reach and have removed the foliage.

**Grazing Period**—See “Grazing Season.”

**Grazing Permit**—See “Permits.”

**Grazing Plan**—See “Management Plan.”

**Grazing Preference**—The status of a qualified permittee acquired by grant, prior use or purchase which entitles him to special consideration over applicants who have not acquired preferences.

**Grazing Season**—An established period of time for which grazing permits are issued.

**Grazing Trespass**—See “Trespass, Grazing.”

**Gully Erosion**—See “Erosion.”

**Gully-Head Plug**—A structure at the head of a gully to prevent its further extension.

**Hedged**—Shrubs so cropped or browsed as to appear clipped artificially.

**Home Ranch**—The permittee's headquarters ranch.

**Indicators, Plant**—Individual species of plants which denote changes in plant cover, soil conditions, and range decline or recovery.



**Indicators, Range**—Are clues to range happenings or guides in recognizing degrees of use and trends in range condition.

**Intensity of Use**—See “Use.”

**Key Areas**—Portions of allotments selected for observations as being representative of the conditions of larger sections. Purpose of observation may be to determine vegetative readiness, retrogressions or progress of growth, acceleration or retardation of soil depletion.

**Key Species**—The valuable forage plants in a range type.

**Kinds of Livestock**—A grouping of grazing animals into three kinds:

1—Cattle and Horses.

2—Sheep and Goats.

3—Swine.

**Lamb Crop** (percentage)—The ratio of lambs produced to the number of ewes bred.

**Lightly Grazed**—See “Use.”

**Limit, Lower**—The number of livestock for which preferences may accrue by grant.

**Limit, Special**—The number of livestock at which an existing preference will be given certain definite protection against reductions for distribution.

**Limit, Upper**—The maximum number of livestock for which preferences may be secured through purchase with waiver, and below which preferences will not be reduced for distribution.

**Livestock Association**—A recognized organization of permittees formed for mutual benefit and to cooperate with the Forest Service in securing better range management.

**Livestock Distribution**—See “Distribution.”

**Livestock, Grade**—Animals of good breeding but not purebred.

**Management Plan**—A written and graphic program of action designed to secure the best practicable handling of livestock on the range.

**Management Unit**—A portion of a range which constitutes a whole to which a plan of operation is applied.

**Natural Revegetation**—Reestablishment of vegetation on damaged ranges through natural propagation of native plants.

**Nutritive Value**—Food qualities of plants to promote growth and produce fat on livestock.

**On and Off Permits**—See “Permits.”

**Open Herding**—Grazing or drifting quietly in open formation with a minimum of control.

**Opening Dates**—The dates on which established grazing seasons begin.

**Overgrazing**—Grazing an allotment beyond its grazing capacity to the extent of injury to plant growth and soil. Infers damage.

**Overstocking**—Grazing more livestock on an allotment than can be grazed without eventual damage to plants and soil.

**Overuse**—See “Use.”

**Paid Permit**—See “Permit.”

**Palatability**—The quality in plants which makes them preferred and relished by livestock.

**Permit, Crossing** — Permission to drive livestock across national forest land on established driveways (issued on Form 874-17).

**Permit, Free**—Grazing permit for exempt livestock (issued on Form 874-19).

**Permit, Grazing**—Written permission to graze a specified number and kind of livestock for a definite period on a defined national forest range.

**Permit, On and Off**—A permit issued for livestock grazing on a range only part national forest land but which is a natural range unit.

**Permit, Paid**—Written permission to graze specified numbers and kinds of livestock for definite period on national forest range for which charges are made. Types are temporary, annual and term.

**Permit, Private Land**—Grazing privileges granted without charge to the owners and lessees for the grazing capacity of private land within the national forest and on which the permittee waives exclusive use.

**Permit, Temporary**—A grazing permit for which no preference is held, and is not subject to renewal.

**Permit, Term**—A grazing permit with a preference issued for a ten-year period, not issued annually.

**Plant Succession**—Changes in plant composition on an area, for example, if an area of ground is bare of vegetation, plants will begin to occupy it sooner or later. As these pioneers die the products of their decay improve the soil and render it more favorable to plant life. Species which make higher demands on the soil than the original pioneers are able to obtain a footing. This progress continues to the stage where the soil is occupied by the highest type of vegetation the particular climate allows. Such a process is called Plant Succession.

**Plots, Fenced**—An area set aside for the study of vegetation. Fenced to exclude livestock.

**Premature Grazing**—Use of range before plant growth is sufficiently advanced for use by livestock and soil surface is so moist that damage will result from trampling.

**Prior Use**—The occupancy of range with livestock prior to its inclusion in a national forest.

**Private Land Permit**—See “Permit, Private Land.”

**Proper Stocking**—See “Stocking.”

**Proper Use Factor**—The degree to which the available herbage of an individual species is cropped when the range is properly utilized. Expressed in percentage.

**Protected Plot**—See “Plots, Fenced.”

**Protection Reduction**—See “Reduction.”

**Quadrat**—See “Plots.”



- Qualifications** — Requirements for eligibility for national forest grazing privileges.
- Range Allotment**—See “Allotment.”
- Range Condition**—The existing condition of the range brought about by climate, grazing, and all other factors that influence soil and vegetation.
- Range Depletion**—An impaired condition of forage on a range.
- Range Destruction**—The damaging of a range so severely through abuse and overuse that it is denuded of all forage plants and the soil is so badly damaged as to have lost all productive capacity.
- Range Deterioration**—The gradual decline of a range from overuse by livestock throughout a period of years.
- Range Division**—See “Allotment.”
- Range Indicators**—See “Indicators.”
- Range Management Plans**—See “Management Plans.”
- Range Plots**—See “Plots.”
- Range Reseeding**—See “Artificial Reseeding.”
- Range Survey**—The making of an inventory on a comprehensive and systematic basis of the grazing resource on ranges for use in the development of range management plans.
- Range Unit**—Often used for an allotment, not to be used for management unit.
- Readiness**—See “Vegetative Readiness.”
- Reduction, Distribution** — A reduction applied to an established preference to provide for new applicants, or for increases in permits below the lower limits.
- Reduction, Transfer**—A reduction made in renewing a grazing preference where livestock or ranch property or both are sold with waiver.
- Reduction, Protection**—Decrease in an individual’s permitted number to safeguard the range from damage.
- Revocation**—The taking away of part or all of an established preference.
- Rotation Grazing**—Varying the time of use of areas from year to year.
- Salting Plan**—A written or graphic program covering the locations of saltgrounds and prescribing the seasonal and quantitative distribution of salt for livestock.
- Seasonal Distribution**—Grazing livestock in a sequence of moves from one area to another as the vegetation develops.
- Seasonal Use**—Applied to spring use, summer use, etc.; not used as zonal or altitude use.
- Sheet Erosion**—See “Erosion.”
- Shoestring Erosion**—See “Erosion.”
- Soil Creep**—The downward movement of surface or topsoil on slopes, accelerated by trampling of livestock.
- Special Limit**—See “Limit, Special.”

- Stocking, Conservative**—Placing on an allotment a number of livestock 15 to 25 per cent below grazing capacity.
- Stocking, Proper**—The grazing upon an allotment of the number of livestock which it will support without injury to the range or other values. See also "Understocking."
- Suitability of Range**—Fitness of range, as to forage, water and topography for use by different kinds of livestock.
- Temporary Permit**—See "Permits."
- Term Permit**—See "Permits."
- Too Early Grazing**—See "Premature Grazing."
- Trespass, Grazing**—Allowing livestock to occupy national forest land in violation of the regulations of the Secretary of Agriculture.
- Type Composition**—The kinds and relative abundance of the plant species that make up a forage type.
- Underuse**—See "Use, Light."
- Understocking**—Placing on or grazing upon an allotment a number of livestock less than grazing capacity.
- Unfenced Plots**—See "Plots."
- Upper Limit**—See "Limit, Upper."
- Use, Allowable**—The extent forage can be grazed without undue injury to the range and other values such as watershed, timber, game and recreation.
- Use, Conservative**—Allowing a safe margin in grazing a range. To graze so as to leave some feed above what is allowable use.
- Use, Light**—One-half or less of allowable use.
- Use, Over**—Utilization beyond grazing capacity. It may be to the extent of injury or merely to overstocking with possible eventual injury.
- Utilization**—The degree to which forage plants are used by range livestock.
- Utilization, Over**—See "Use, Over."
- Utilization Standards**—The measure or signs by which the trained observer recognizes allowable use.
- Vegetative Readiness**—That stage in the growth of forage plants when grazing may be permitted.
- Vegetative Types**—See "Forage Types."
- Waiver of Grazing Privilege**—The formal written return to the Government of grazing preference, executed in the case of sale of permitted livestock or commensurate property or both.
- Waste Range**—Range of too low value for use or which cannot be grazed due to inaccessibility, lack of water, etc.
- Water Table Dam**—A structure built on eroded watercourse for the principal purpose of raising the water table within reach of the plant roots.
- Weeds**—See "Classes of Forage Plants."



## APPENDIX 2

### COMMENSURABILITY SURVEYS

Complete information relative to amount, kind, condition of ranch property, as well as its production and use, is a necessary record for fair and just action on grazing applications. A few of the permittees' ranches should be examined each winter, making it a special and complete job. It is also desirable to appraise the indicators of the permittee's qualifications for a satisfactory and successful operation on the national forest.

The following will guide the forest officer in making the survey and appraisal above outlined:

#### **Ranch Property**

Prepare map of owned land, showing:

1. Exterior boundaries.
2. Hay land.
3. Grain.
4. Other crops.
5. Pasture.

Secure brief description and production of leased land.

Record for owned and leased lands separately:

1. Hay production, kind and quantity, current year and average.
2. Other crop production, kind and quantity.
3. Pasture grazing capacity.

Hay and supplements purchased.

#### **Water Conditions**

1. For irrigation.
2. For livestock during critical periods.
3. Possibilities for further development.

#### **Livestock**

##### **Cattle**

Breed.

Number of cows.

Number of steers.

Number of yearlings.

Number of calves.

Number and quality of bulls.

Calving period.

Marketing.

Time sales are made.

Classes and amount sold (beef, feeders, calves, old cows).

## Sheep

- Breed.
- Number ewes owned.
- Lambing period.
- Marketing.
  - Time lamb sales are made.
  - Numbers sold.

## Horses

- Number, breed and sales if breeder.
- Saddle and work stock.
  - Number and quality.

Swine (numbers and pertinent information).

Goats (number and pertinent information).

## Structures

- Barns, capacity, condition.
- Fences, adequacy, condition.
- Corrals, chutes, scales and other handling facilities, adequacy and condition.
- Equipment and machinery, condition.

## Actual Use and Annual Schedule in Livestock Management

Time and number of livestock on home ranch.

- On pasture.
- On feed.
- Supplements.
- On leased land.
- On national forest land.
- On other land.

## Critical Gaps in Yearlong Operation and Possibilities for Solution

### Dependency

- Suitability of property for existing type of operation.
- Importance of national forest range.
- Availability of other than national forest forage.
- Level of need.

### Commensurability Factors

- Grazing capacity of owned land.
- Grazing capacity of leased land.
- Number for which national forest permit is required for economic operation.

The job of handling livestock on the complex national forest range is not a simple one, since it involves more than normal care of range in addition to the already complex job of managing both ranch and livestock. To those



unable to put forth a full measure of effective managerial effort, it is often less economic than confining operations to the home ranch with a smaller number of livestock. Satisfactory handling of livestock on national forest range and at the same time operating the home ranch requires high managerial ability or skill, certain financial or business ability, and a true concept of range husbandry.

The following indicators of qualifications for successful operations and satisfactory land husbandry will guide in the appraisal of an applicant and his ranch property.

1. Does the permittee endeavor to build and maintain a feed surplus to meet abnormal winter conditions?
2. Are there evidences of overgrazing in pastures?
3. Is there any evidence of erosion in pastures?
4. Is water developed to secure best use?
5. Is salting done on a systematic and adequate scale?
6. Are a sufficient number of saddle animals owned to handle cattle both on winter and summer ranges? What is their condition and fitness for range work?
7. What is the quality of cattle? Sheep?
8. Does the herd show good management in breeding up?
9. Does the permittee practice controlled breeding of cattle?
10. Proportionate number of cows and bulls? How do the bulls compare with those of others as to breed and age?
11. Does the permittee practice dehorning?
12. Quantity of hay fed per head? Other rations by amounts?
13. In what condition are the cattle when entering forest range? Is permittee systematically breeding to secure his objectives?
14. Does permittee keep records to indicate increased weight, costs, sales, etc.?
15. Is systematic culling of old livestock practiced?
16. Is the dwelling adequate, neat, painted and in good repair?
17. Are all barns, feed sheds and other buildings painted, neat and in repair?
18. Are all needed livestock handling facilities such as fences, lambing sheds, feed racks and salt troughs supplied and in good shape?
19. Does the group of home buildings present an orderly set-up with good fences in repair wherever needed for separation of use?
20. Is all needed up-to-date equipment available?
21. Are trucks, other rolling stock and agricultural implements housed and maintained in good condition?
22. Are fields cultivated to prevent erosion by taking advantage of the slope?
23. Do fields show good farming practice?

## ESTIMATING CONTENTS OF HAYSTACKS AND GRAZING CAPACITY OF PASTURES

To calculate the contents of stack, measure the length and width at the ground and the average distance over the stack from the ground on one side to the ground on the other, then use the following formula :

$$\frac{(\text{Over} - \text{width})}{3} \times \text{Width} \times \text{Length} \div 450 = \text{Tons of wild hay or alfalfa stacked 90 days or over.}$$
 This is a simple rule and sufficiently accurate for our use.

The grazing capacity of pastures is estimated by comparison with areas of known grazing capacity or by judging its capacity from the actual use made of it. The former method requires knowledge of experimental areas or properly stocked ranches similar in character and an ability to judge the relative capacity on a basis of quantity and quality of forage. The latter requires accurate figures on actual use and an ability to recognize proper use and the earmarks of depletion in the type.

It is desirable to have a map of the ranch property by types of farming and/or forage types together with hay and grain production, actual use and pertinent information on supplemental feeds produced. The accuracy of the record needed on leased land depends upon the permanency of tenure and the time required to secure the essential information.

Commensurability data should be filed in the open file for the permittee in the supervisor's office.



## APPENDIX 3

### BREEDS OF LIVESTOCK

#### SHEEP

There are three important qualities that breeders may seek:

1. Weight and quality of wool.
2. Ability to produce a good lamb.
3. Adaptability to range conditions.

There are 17 or more breeds of sheep in the United States. They are classified into various types as follows:

Wool type—fine wool—Merino and Rambouillet.

Mutton type { Medium wool—Southdown, Shropshire, Hampshire, etc.  
Long wool—Lincoln, Cotswald, etc.

The *Wool types* have fine wool of good weight, have a well-developed herding instinct, do well on rough and scanty range and are less prolific breeders. Lambs are lighter in weight. For open range conditions, good lambs are obtained by breeding to mutton-type bucks, especially Hampshires (blackfaces).

The *Mutton type* has a somewhat less valuable fleece, does not herd as well, scatters widely, fares poorly on scanty range, is a prolific breeder, produces high percentage and high quality lambs, does best on good feed, is more of a farm sheep.

Most of the herds using the national forests are cross-breed—fine-wooled breeds with Hampshire or other medium-wooled breeds. The purpose of cross-breeding has been to secure the combined value of the desirable qualities of lamb and wool and maintain the adaptability to range conditions.

#### CATTLE

The important breeds are Shorthorns and Herefords. The black Aberdeen-Angus is found occasionally on national forest ranges.

The Shorthorn or Durham is distinguished by colors from solid red, roan, roan and white, and even pure white. It is large and well proportioned. The cows give plenty of milk, making for a good, rapid growing calf. Is a poor rustler on rough or scanty range. Has high fattening qualities and is the most popular breed in American cattle markets. Valuable in breeding up scrub cattle.

The Hereford is distinguished by its white face (commonly so-called), white on its neck, breast, belly, and legs. Otherwise it is red. It is smaller, somewhat light in hindquarters, but is of late more popular because of its smaller cuts now preferred in the markets. It is outstanding in its ability as a rustler, does well on scanty and fairly rough range and withstands adverse climatic conditions. Is low in milk production, less docile than the Shorthorn and is slower to adapt itself to farm conditions and feed lots. Thirty-eight per cent of the beef animals in California are Herefords.

There is much intentional and accidental cross-breeding between Herefords and Shorthorns for the purpose of securing a combination of the desired qualities of each. The progeny bears the markings and colors of both breeds and crosses are easily recognized. Cross-breeding has many limitations and does not always produce the results desired.

## APPENDIX 4

### BASE RATES ON GRAZING FEES AS DETERMINED BY RANGE APPRAISAL, 1931

Forests	Cents per head per month	
	Cattle	Sheep
Angeles .....	19	5.5
Cleveland .....	19	5.5
Eldorado .....	19	6.
Inyo .....	18	5.5
White Mt. ....	17	5.
Klamath .....	18	5.5
Western part .....	15	5.
Lassen .....	19	5.5
Los Padres .....	19	5.5
Mendocino.....	18	5.5
Modoc .....	18	5.5
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The grazing fees for each year are adjusted by increasing or reducing the above base rates in direct proportion to the change in the average prices of lambs and beef cattle during the preceding calendar year. Each supervisor is advised in January each year of the adjustment to be made. (See Manual.)



## APPENDIX 5

### SUPERVISORS' CALENDAR OF RANGE MANAGEMENT REPORTS

Title	Due in Regional Office
Annual Grazing, Form 446	December 1.
Maps, two copies with Form 446 in 1939 and each five years thereafter unless material changes make intermediate submission desirable	December 1.
Range Improvement Maintenance Needs	As requested, February 1 to March 1.
Copies of all Letters of Transmittal except Second Payments	As issued.
State Livestock Association Officers	As elected.

## APPENDIX 6

### UPPER AND LOWER LIMITS

Forest	C. & H.		S. & G.	
	Lower	Upper	Lower	Upper
CALIFORNIA and NEVADA				
Angeles .....	200	400	0	0
Cleveland .....	200	300	0	0
Eldorado .....	200	300	1250	2500
Inyo .....	200	400	1000	2000
Klamath .....	200	300	0	0
Lassen .....	200	300	1000	3000
		400		
Los Padres .....	200	300	0	0
Mendocino .....	200	300	1000	2000
Modoc .....	200	300	1000	2000
		500		
Mono .....	200	400	1800	2700
Plumas .....	200	300	1000	2500
San Bernardino .....	200	400	0	0
Sequoia .....	200	500	0	0
Shasta .....	200	400	1000	2500
Sierra .....	200	400	1250	2500
Stanislaus .....	200	400	1000	2000
Tahoe .....	200	300	1000	2500
Trinity .....	200	400	1000	2000

Special limits have been established by the Regional Forester in connection with certain individual cases on recommendation of the forest supervisor. Other similar cases will be handled when appropriate recommendations are made by the field.



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